REGULAR, 8/14/2017 1:30:00 PM

BE IT REMEMBERED that on August 14, 2017, there was begun and holden a REGULAR session of the Commissioners Court of Jefferson County, Texas, with the following members and officers present and participating except those absent as indicated:

Honorable Jeff Branick, County Judge

Commissioner Eddie Arnold, Commissioner Pct. No. 1

Commissioner Brent Weaver, Commissioner Pct. No. 2

Commissioner Michael Sinegal, Commissioner Pct. No. 3

Commissioner Everette D. Alfred, Commissioner Pct. No. 4

Honorable Zena Stephens, Sheriff

Honorable Carolyn L. Guidry , County Clerk

When the following proceedings were had and orders made, to-wit:

Jeff R. Branick, County Judge
Eddie Arnold, Commissioner, Precinct One
Brent A. Weaver, Commissioner, Precinct Two
Michael S. Sinegal, Commissioner, Precinct Three
Everette "Bo" Alfred, Commissioner, Precinct Four

NOTICE OF MEETING AND AGENDA OF COMMISSIONERS' COURT OF JEFFERSON COUNTY, TEXAS August 14, 2017

Notice is hereby given that the Commissioners' Court of Jefferson County, Texas, willmeet at **1:30 PM,** on the **14th** day of **August 2017** at its regular meeting place in the Commissioners' Courtroom, 4th Floor, Jefferson County Courthouse, 1149 Pearl Street, Beaumont, Texas.

Said meeting will be a **Regular** for the purpose of transacting the routine business of the County. Persons with disabilities requiring auxiliary aids for services who wish to attend this meeting should contact the County Judge's Office to arrange for assistance.

In addition to the routine business of the County, the subject of said meeting will be the following:

WORKSHOP:10:00 a.m.- Discuss pending FY 2018 budget issues and budget calendar.

WORKSHOP:1:00 P.M.-To receive information regarding the current Sheriff and Constable fees charged pursuant to Sec.118.131, Texas Local Government Code.

Immediately following Commissioners Court-Announcement of an executive (closed) session pursuant to Texas Government Code Section § 551.072 for deliberation regarding real property and whereas deliberation in open meeting would have a detrimental effect on the position of the government body in negotiations with a third person.

Immediately following Commissioners Court-Announcement of an executive (closed) session pursuant to Texas Government Code Section § 551.0725 for deliberation regarding contract negotiations and whereas deliberation in open meeting would have a detrimental effect on the position of the government body in negotiations with a third party.

INVOCATION: Everette "Bo" Alfred, Commissioner, Precinct Four

PLEDGE OF ALLEGIANCE: Eddie Arnold, Commissioner, Precinct One

PURCHASING:

1. Receive and file bids for Invitation for Bid (IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport.

SEE ATTACHMENTS ON PAGES 11 - 1948

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

2. Consider and approve a renewal for (IFB 16-019/YS), Term Contract for Sheriff's Department (Jefferson County) Uniforms & Equipment with 10-32 Supply for a first one (1) year renewal from August 21, 2017 to August 20, 2018.

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

3. Consider and approve, execute, receive and file a renewal for (IFB 16-019/YS), Term Contract for Sheriff's Department (Jefferson County) Uniforms & Equipment for a first one (1) year renewal from August 21, 2017 to August 20, 2018 with Burgoon Company, GT Distributors, Galls, LLC, and ICS Jail Supplies with proposed price increases from Galls, LLC as shown on Attachment A. These price increases are due to increased manufacturer costs.

SEE ATTACHMENTS ON PAGES 1949 - 1960

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

4. Consider and approve, execute, receive and file a renewal for (IFB 13-016/JW), Term Contract for Disaster and Emergency Repair, Service, and Installation of Electrical Services for Jefferson County for a fourth and final one (1) year renewal from September 5, 2017 to September 4, 2018 with Gold Crest Electrical Company, Inc. and Ledet Electrical Services with proposed price increases from Gold Crest Electrical Company, Inc. as shown on Attachment B. These price increases are due to increased labor and insurance costs.

SEE ATTACHMENTS ON PAGES 1961 - 1965

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

5. Consider and approve, execute, receive and file Amendment VI (six) for (IFB 15-011/JW), Term Contract for Trash and Biomedical Waste Container Service for Jefferson County. This amendment will add Standard Waste Containers (10 cubic yards &; under) Service for Jefferson County Road & Bridge, Precinct 3, Stockpile, 24420 Highway 124, Beaumont TX, 77705 for one (1) four (4) cubic yard waste container to be serviced one (1) time per week for $45.00 per month.

SEE ATTACHMENTS ON PAGES 1966 - 1966

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

6. Consider and approve transfer of (1) vehicle 2017 Ford Explorer VIN 1FM5K8AR1HGB93852 from Port Arthur Independent School District to A.S.A.P. Program.

SEE ATTACHMENTS ON PAGES 1967 - 1967

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

7. Consider and approve an auction of surplus property as authorized by Local Government Code §263.152 (a) (1) to be auctioned by Horn's Auction Inc. The auction is scheduled for Saturday, September 2, 2017 at 9:00 A.M.

SEE ATTACHMENTS ON PAGES 1968 - 1969

Motion by: Commissioner Weaver
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

CONSTABLE PRECINCT 1:

8. Consider and possibly approve a Resolution authorizing the offices of the Jefferson Constables for Precincts 1,2,6,7 and 8 grant application to the Office of the Governor for the Rifle Resistant Body Armor Project. (Grant No. 3441801)

SEE ATTACHMENTS ON PAGES 1970 - 1972

Motion by: Commissioner Alfred
Second by: Commissioner Arnold
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

CONSTABLE PRECINCT 2:

9. Consider and possibly approve the hiring of Jevonne Smith- Pollard as a Part Time Deputy Constable with Constable Precinct 2 in accordance with Local Government Code (LGC) 86.011.

SEE ATTACHMENTS ON PAGES 1973 - 1973

Motion by: Commissioner Sinegal
Second by: Commissioner Weaver
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

COUNTY AUDITOR:

10. Consider and approve budget transfer - Service Center - additional cost for repairs due to wrecks.

120-8095-417-4008	AUTOMOBILES AND TRUCKS	$20,000.00	
120-8095-417-3037	GASOLINE		$20,000.00

SEE ATTACHMENTS ON PAGES 1974 - 1974

Motion by: Commissioner Alfred
Second by: Commissioner Sinegal
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

11. Consider and approve budget transfer - Road &; Bridge Pct.2 - cost for work on Stillwater Dr.

112-0208-431-6036	ROW CO. & LATERAL ROADS	$14,425.00	
112-0202-431-3079	CRUSHED STONE		$14,425.00

SEE ATTACHMENTS ON PAGES 1975 - 1975

Motion by: Commissioner Alfred
Second by: Commissioner Sinegal
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

12. Consider and approve budget transfer – Marine Division –cover the remaining adjusted amount of the $280,068 match for the 2015 Port Security Grant.

865-0000-491-8074	PORT SECURITY GRANT	$173,675.00	
865-3054-421-1043	DEPUTIES		$68,000.00
865-3054-421-1098	OVERTIME ALLOWANCE		$70,000.00
865-3054-421-1099	TERMINATION ALLOWANCE		$15,675.00
865-3054-421-2002	EMPLOYEES' RETIREMENT		$20,000.00

SEE ATTACHMENTS ON PAGES 1976 - 1978

Motion by: Commissioner Alfred
Second by: Commissioner Sinegal
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

13. Regular County Bills – check #436640 through checks #436934.

SEE ATTACHMENTS ON PAGES 1979 - 1988

Motion by: Commissioner Alfred
Second by: Commissioner Sinegal
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

COUNTY COMMISSIONERS:

14. Consider, possibly approve and authorize the County Judge to execute an Inter-local agreement between Jefferson County, Texas and the City of Port Arthur, Texas for road repairs, shrubbery and weed control pursuant to Sec.§ 791.014, Texas Government Code.

SEE ATTACHMENTS ON PAGES 1989 - 1995

Motion by: Commissioner Arnold
Second by: Commissioner Weaver
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

15. Discuss Proposed tax rate for tax year 2017 (fiscal year 2017-2018).

MAINTAINED EFFECTIVE TAX RATE

Motion by: Commissioner Arnold
Second by: Commissioner Weaver
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

16. Consider and approve proposing a tax rate of _____ for tax year 2017 (fiscal year 2017-2018) and schedule two public hearings on the proposed tax rate for Tuesday, September 5, 2017 at 1:30pm and Monday, September 11, 2017 at 1:30pm in the Commissioners Courtroom.

SEE ATTACHMENTS ON PAGES 1996 - 1996

Action: NONE

SHERIFF'S DEPARTMENT:

17. Consider and possibly approve a Resolution to authorize the Jefferson County Sheriff's Office to apply for the Rifle-Resistant Body Grant, Grant No. 3441801 through the Office of the Governor, Criminal Justice Division

SEE ATTACHMENTS ON PAGES 1997 - 1997

Motion by: Commissioner Sinegal
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

18. Receive and file executed Inter-local contract between Jefferson County Sheriff's Office and the City of Port Arthur, Texas for the purpose of maintaining a Multi-Agency Narcotics Enforcement Unit pursuant to Sec. 791.011, Texas Government Code.

SEE ATTACHMENTS ON PAGES 1998 - 2008

Motion by: Commissioner Sinegal
Second by: Commissioner Alfred
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

ADDENDUMS

DISTRICT ATTORNEY:

19. Immediately following Commissioners Court-Announcement of an executive (closed) session pursuant to Texas Government Code Section § 551.072 for deliberation regarding real property and whereas deliberation in open meeting would have a detrimental effect on the position of the government body in negotiations with a third person.

Motion by: Commissioner Sinegal
Second by: Commissioner Arnold
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

20. Immediately following Commissioners Court-Announcement of an executive (closed) session pursuant to Texas Government Code Section § 551.0725 for deliberation regarding contract negotiations and whereas deliberation in open meeting would have a detrimental effect on the position of the government body in negotiations with a third party.

Motion by: Commissioner Sinegal
Second by: Commissioner Arnold
In favor: County Judge Branick, Commissioner Arnold, Commissioner Weaver, Commissioner Sinegal, Commissioner Alfred
Action: APPROVED

_____

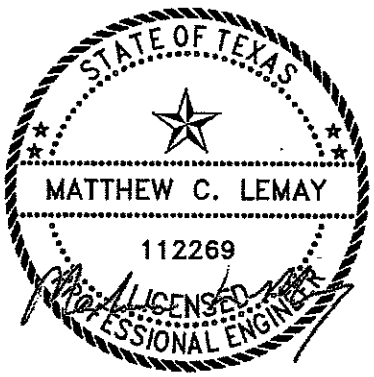
Jeff R. Branick
County Judge

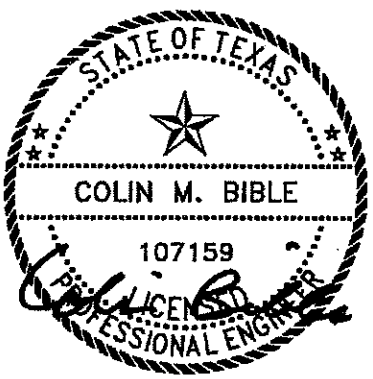
JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')

AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

Jefferson County Project 17-024/JW





Garver Project Number 17121501

July 2017

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')

AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

Jefferson County Project 17-024/JW



TEXAS REGISTERED ENGINEERING FIRM F-5713

Garver Project Number 17121501

June 2017

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SECTION A
ADVERTISEMENT AND INVITATION TO BID

JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah L. Clark, Purchasing Agent

1149 Pearl Street, 1st Floor, Beaumont, TX 77701 409-835-8593 Fax 409-835-8456

LEGAL NOTICE
Advertisement for Invitation for Bids

July 10, 2017

Notice is hereby given that sealed bids will be accepted by the Jefferson County Purchasing Department for IFB 17-024/JW, Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport . **Information for this project may be obtained from the Jefferson County website, http://www.co.jefferson.tx.us/Purchasing/main.htm or by calling 409-835-8593. Specifications, plans, and bidding documents can be obtained from CivCast website at https://www.civcastusa.com. Project ID is BPT_17-024/JW.**

Bids are to be sealed and addressed to the Purchasing Agent with the bid number and name marked on the outside of the envelope or box. Bidders shall forward an original and three (3) copies of their bid to the address shown below. Neither Jefferson County nor CivCast will accept bids submitted electronically. Late bids will be rejected as non-responsive. Bids will be publicly opened and read aloud in the Jefferson County Commissioners' Courtroom at the time and date below. Bidders are invited to attend the sealed bid opening.

BID NAME:	**Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport**
BID NO:	**IFB 17-024/JW**
DUE DATE/TIME:	**11:00 AM CDT, Tuesday, August 8, 2017**
MAIL OR DELIVER TO:	**Jefferson County Purchasing Department 1149 Pearl Street, 1st Floor Beaumont, Texas 77701**

ere will be a pre-bid conference and walk-through at 10:00 AM CDT on Tuesday, July 25, 2017 in the Airport Administration Conference Room at 5000 Jerry Ware Blvd., Beaumont, Texas 77705. This conference will be bidder's only opportunity to view secured areas of the project.

The County shall require the bidder to furnish a bid security in the amount of five percent (5%) of the total contract cost. The bid bond must be executed with a surety company authorized to do business in the State of Texas. Within ten (10) days after the date of the signing of a contract, the bidder shall furnish a performance bond to the County for the full amount of the contract, if the contract exceeds one hundred thousand dollars ($100,000). If the contract is for one hundred thousand dollars ($100,000) or less, the County may provide that no money be paid to the contractor until completion and acceptance of the work or the fulfillment of the purchase obligation to the County.

Any questions relating to these requirements should be directed to Jamey West, Assistant Purchasing Agent, at 409-835-8593 or jwest@co.jefferson.tx.us

Jefferson County encourages Disadvantaged Business Enterprises to participate in the bidding process. Jefferson County does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in employment or the provisions of services. Individuals requiring special accommodations are requested to contact our office at 409-835-8593 to make arrangements no later than seven (7) calendar days prior to the submittal deadline. Jefferson County reserves the right to accept or reject any or all proposals, to waive technicalities and to take whatever action is in the best interest of Jefferson County.

All interested firms are invited to submit a bid in accordance with the terms and conditions stated in this bid.

Respondents are strongly encouraged to carefully read the entire invitation.

Deborah Clark

borah L. Clark, Purchasing Agent
rferson County, Texas

Publish: Beaumont Enterprise & Port Arthur News – July 12, 2017 and July 19, 2017

Bid Submissions:

Bidder is responsible for submitting:

- One (1) *original* bid copy to include a completed copy of this specifications packet, in its entirety.

- Written Number Here (# here) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

Additionally, Bidder must monitor the Jefferson County Purchasing Department Website (below) to see if addenda or additional instructions have been posted. Failure to return all required forms could result in a response being declared as non-responsive.

http://www.co.jefferson.tx.us/purchasing/main.htm

SECTION B
INSTRUCTIONS TO BIDDERS

Instructions to Bidders

1. Bid Submission

Bids must be submitted in complete original form by mail or messenger to the following address:

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, TX 77701

Bids will be accepted at the above address until the time and date specified herein, and immediately after will be publicly opened and read aloud.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked with the Bid Number, Bid Name, Bid Due Date, and the Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Late bids will not be accepted and will be returned unopened to the bidder.

All bids submitted in response to this invitation shall become the property of Jefferson County and will be a matter of public record available for review.

2. Bid Submissions During Time of Inclement Weather, Disaster, or Emergency

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a bid/proposal/statement of qualifications submission deadline, the bid closing will automatically be postponed until the next business day that County offices are open to the public. Should inclement weather conditions or any other unforeseen event cause delays in courier service operations, the County may issue an addendum to all known vendors interested in the project to extend the deadline. It will be the responsibility of the vendor to notify the county of their interest in the project should these conditions impact their ability to submit a bid/proposal/statement of qualifications submission before the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

Should an emergency or unanticipated event interrupt normal County processes, and bid/proposal/statement of qualifications submissions cannot be received by the Jefferson County Purchasing Department's office by the exact time specified in the IFB and urgent County requirements preclude amendment to the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first business day on which normal County processes resume.

3. Courthouse Security

Bidders are advised that all visitors to the Courthouse must pass through Security. **Bidders planning to hand deliver bids must allow time to get through Security, as a delay in entering the Courthouse will not be accepted as an excuse for late submittal.** Mondays and Tuesdays are particularly heavy days. Bidders are strongly urged to plan accordingly.

4. Preparation of Bids

The bid shall be legibly printed in ink or typed.

If a unit price or extension already entered is to be altered, it shall be crossed out and initialed in ink by the bidder.

The bid shall be legally signed and shall include the complete address of the bidder.

Jefferson County is exempt from Federal and State Sales Taxes, and such taxes shall not be included in bid prices.

5. Signatures

All bids, notifications, claims, and statements must be signed by an individual authorized to bind the bidder. The individual signing certifies, under penalty of perjury, that he or she has the legal authorization to bind the bidder.

6. County Holidays – 2017:

January 1st and 2nd	Sunday & Monday	New Year's Day
January 16	Monday	Martin Luther King, Jr. Day
February 20	Monday	President's Day
April 14	Friday	Good Friday
May 29	Monday	Memorial Day
July 4	Tuesday	Independence Day
September 4	Monday	Labor Day
November 10	Friday	Veterans Day
November 23rd & 24th	Thursday & Friday	Thanksgiving
December 25th	Monday	Christmas

7. Rejection or Withdrawal

Submission of additional terms, conditions or agreements with the bid document are grounds for deeming a bid non-responsive and may result in bid rejection. Jefferson County reserves the right to reject any and all bids and to waive any informalities and minor irregularities or defects in bids. Bids may be withdrawn in person by a bidder or authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the withdrawal is made prior to the time set for receipt of bids. Bids are an irrevocable offer and may not be withdrawn within 90 days after opening date.

8. Emergency/Declared Disaster Requirements

In the event of an emergency or if Jefferson County is declared a disaster area, by the County, State, or Federal Government, this Acceptance of Offer may be subjected to unusual usage. Contractor shall service the county during such an emergency or declared disaster under the same terms and conditions that apply during non-emergency/disaster conditions. The pricing as specified in this Acceptance of Offer shall apply to serving the County's needs regardless of the circumstances. If Contractor is unable to supply the services under the terms of the Acceptance of Offer, then Contractor shall provide proof of such disruption and a copy of the invoice from Contractor's supplier(s). Additional profit margin as a result of supplying services during an emergency or declared disaster shall not be permitted. In the event that additional equipment, supplies, and materials are required during the declared disaster, additional shipping, handling and drayage fees may apply.

9. Award

The bid will be awarded to the responsible, responsive bidder(s) whose bid, conforming to the solicitation, will be most advantageous to Jefferson County – price and other factors considered. Unless otherwise specified in this IFB, Jefferson County reserves the right to accept a bid in whole or in part, and to award by item or by group, whichever is deemed to be in the best interest of Jefferson County. Any bidder who is in default to Jefferson County at the time of submittal of the bid shall have that bid rejected. Jefferson County reserves the right to clarify any contractual terms with the concurrence of the Contractor; however, any substantial nonconformity in the offer, as determined by Jefferson County, shall be deemed non-responsive and the offer rejected.

In evaluating bids, Jefferson County shall consider the qualifications of the bidders, and, where applicable, operating costs, delivery time, maintenance requirements, performance data, and guarantees of materials and equipment. In addition, Jefferson County may conduct such investigation as it deems necessary to assist in the evaluation of a bid and to establish the responsibility, qualifications, and financial ability of the bidders to fulfill the contract.

Jefferson County reserves the right to award this contract on the basis of **lowest and best bid** in accordance with the laws of the State of Texas, to waive any formality or irregularity, to make awards to more than one offeror, and/or to reject any or all bids. In the event the lowest dollar offeror meeting specifications is not a awarded a contract, Offeror may appear before the Commissioners' Court and present evidence concerning Offeror responsibility after officially notifying the Office of the Purchasing Agent of Offeror's intent to appear.

10. Contract

A response to an IFB is an offer to contract with Jefferson County based upon the terms, conditions, and specifications contained in the IFB. Bids do not become contracts unless and until they are executed by Jefferson County, eliminating a formal signing of a separate contract. For that reason, all of the terms and conditions of the contract are contained in the IFB, unless any of the terms and conditions is modified by an IFB Amendment, a Contract Amendment, or by mutually agreed terms and conditions in the contract documents.

11. Waiver of Subrogation

Bidder and bidder's insurance carrier waive any and all rights whatsoever with regard to subrogation against Jefferson County as an indirect party to any suit arising out of personal or property damages resulting from bidder's performance under this agreement.

12. Fiscal Funding

A multi-year contract (if requested by the specifications) continuing as a result of an extension option must include fiscal funding out. If, for any reason, funds are not appropriated to continue the contract, said contract shall become null and void.

13. Bid Results

Bid results are not provided in response to telephone inquiries. A preliminary tabulation of bids received will be posted on the Purchasing web page (http://co.jefferson.tx.us/ purchasing/main.htm) as soon as possible following bid opening. A final tabulation will be posted following bid award, and will also be available for review in the Purchasing Department.

14. Changes and Addenda to Bid Documents

Each change or addendum issued in relation to this IFB document will be on file in the Office of the Purchasing Agent, and will be posted on the Purchasing web site as soon as possible. It shall be the bidder's responsibility to make inquiry as to change or addenda issued, and to monitor the web site. All such changes or addenda shall become part of the contract and all bidders shall be bound by such addenda. Information on all changes or addenda issued will be available at the Office of the County Purchasing Agent.

15. Specifications

Unless otherwise stated by the bidder, the bid will be considered as being in accordance with Jefferson County's applicable standard specifications, and any special specifications outlined in the bid document. References to a particular trade name, manufacturer's catalogue, or model number are made for descriptive purposes to guide the bidder in interpreting the requirements of Jefferson County, and should not be construed as excluding bids on other types of materials, equipment, and supplies. However, the bidder, if awarded a contract, will be required to furnish the particular item referred to in the specifications or description unless departure or substitution is clearly noted and described in the bid. Jefferson County reserves the right to determine if equipment/ product being bid is an acceptable alternate. All goods shall be new unless otherwise so stated in the bid. Any

unsolicited alternate bid, or any changes, insertions, or omissions to the terms and conditions, specifications, or any other requirements of the bid, may be considered non-responsive.

16. Delivery

Bids shall include all charges for delivery, packing, crating, containers, etc. Unless otherwise stated by the bidder (in writing on the included Bid Form), prices bid will be considered as being based on F.O.B. destination/delivered freight included.

17. Interpretation of Bid and/or Contract Documents

All inquiries shall be made within a reasonable time prior to the date and time fixed for the bid opening, in order that a written response in the form of an addendum, if required, can be processed before the bids are opened. Inquiries received that are not made in a timely fashion may or may not be considered.

18. Currency

Prices calculated by the bidder shall be stated in U.S. dollars.

19. Pricing

Prices shall be stated in units of quantity specified in the bid documents. In case of discrepancy in computing the amount of the bid, the unit price shall govern.

20. Notice to Proceed/Purchase Order

The successful bidder may not commence work under this contract until authorized to do so by the Purchasing Agent.

21. Certification

By signing the offer section of the Offer and Acceptance page, bidder certifies:

- The submission of the offer did not involve collusion or other anti-competitive practices.
- The bidder has not given, offered to give, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to any public servant in connection with the submitted offer.
- The bidder hereby certifies that the individual signing the bid is an authorized agent for the bidder and has the authority to bind the bidder to the contract.

22. Definitions

"County" – Jefferson County, Texas.

"Contractor" – The bidder whose proposal is accepted by Jefferson County.

23. Minority-Women Business Enterprise Participation

It is the desire of Jefferson County to increase the participation of Minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the County does not have any preference or set aside programs in place, it is committed to a policy of equitable participation for these firms.

General Conditions of Bidding and Terms of Contract

By execution of this document, the vendor accepts all general and special conditions of the contract as outlined below and in the specifications and plans.

1. Bidding

1.1 Bids. All bids must be submitted on the bid form furnished in this package.

1.2 Authorized Signatures. The bid must be executed personally by the vendor, duly authorized partner of the partnership, or duly authorized officer of the corporation. If executed by an agent, a power of attorney or other evidence of authority to act on behalf of the vendor shall accompany the bid to become a valid bid.

1.3 Late Bids. Bids must be in the office of the Jefferson County Purchasing Agent before or at the specified time and date bids are due. Bids received after the submission deadline shall be rejected as non-responsive and returned unopened.

1.4 Withdrawal of Bids Prior to Bid Opening. A bid may be withdrawn before the opening date by submitting a written request to the Purchasing Agent. If time allows, the bidder may submit a new bid. Bidder assumes full responsibility for submitting a new bid before or at the specified time and date bids are due. Jefferson County reserves the right to withdraw a request for bids before the opening date.

1.5 Withdrawal of Bids after Bid Opening. Bidder agrees that its offer may not be withdrawn or cancelled by the vendor for a period of ninety (90) days following the date and time designated for the receipt of bids unless otherwise stated in the bid and/or specifications.

1.6 Bid Amounts. Bids shall show net prices, extensions where applicable and net total. In case of conflict between unit price and extension, the unit price will govern. Any ambiguity in the bid as a result of omission, error, unintelligible or illegible wording shall be interpreted in the favor of Jefferson County.

1.7 Exceptions and/or Substitutions. All bids meeting the intent of the specifications and plans will be considered for award. Vendors taking exception to the specifications and plans, or offering substitutions, shall state these exceptions in the section provided. If bid is made on an article other than the one specified, which a bidder considers comparable, the name and grade of said article must be specified in the bid and sufficient specifications and descriptive data must accompany same to permit thorough evaluation. The absence of stated exceptions and/or substitutions shall indicate that the vendor has not taken any exceptions to the specifications and shall be responsible to perform in strict accordance with the specifications. As a matter of practice, Jefferson County rejects exception(s) and /or substitutions as non-responsive but reserves the right to accept any and/or all of the exception(s) and/or substitution(s) deemed to be in the best interest of Jefferson County.

1.8 Alternates. The Invitation for Bid and/or specifications may expressly allow bidder to submit an alternate bid. Presence of such an offer shall not be considered an indication of non-responsiveness.

1.9 Descriptions. Unless otherwise specified, any reference to make, manufacturer and/or model used in the bid specifications is merely descriptive and not restrictive, and is used only to indicate type, style, or quality of material desired.

1.10 Bid Alterations. Bids cannot be altered or amended after submission deadline. Any interlineations, alterations, or erasures made before opening time must be initialed by the signer of the bid, guaranteeing authenticity.

1.11 Tax Exempt Status. Jefferson County is exempt from federal excise tax and state sales tax. Unless the bid form or specifications specifically indicate otherwise, the bid price must be net, exclusive of above-mentioned taxes and will be so construed. Therefore, the bid price shall not include taxes.

1.12 Quantities. Quantities indicated are estimated quantities only and are not a commitment to buy. Approximate usage does not constitute an order, but only implies the probable quantity that will be used. Commodities will be ordered on an as-needed basis. Bidder is responsible for accurate final counts.

1.13 Bid Award. Award of contract shall be made to the most responsible, responsive bidder, whose offer is determined to be the best value, taking into consideration the relative importance of price. Jefferson County reserves the right to be the sole judge as to whether items bid will serve the purpose intended. Jefferson County reserves the right to accept or reject in part or in whole any bid submitted, and to waive any technicalities or informalities for the best interest of the County. Jefferson County reserves the right to award based upon individual line items, sections or total bid.

1.14 Silence of Specifications for Complete Units. All materials, equipment and/or parts that will become a portion of the completed work, including items not specifically stated herein but, necessary to render the service(s) complete and operational per the specifications, are to be included in the bid price. Vendor may be required to furnish evidence that the service, as bid, will meet or exceed these requirements.

1.15 Addenda. Any interpretations, corrections or changes to the specifications and plans will be made by addenda no later than forty-eight (48) hours prior to the bid opening. Addenda will be posted on the Purchasing web site. Vendors are responsible for monitoring the web site in order to remain informed on addenda. Vendors shall acknowledge receipt of all addenda with submission of bid.

1.16 General Bid Bond/Surety Requirements. Failure to furnish bid bond/surety, if requested, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.17 General Insurance Requirements. Failure to furnish Affidavit of Insurance, if required in these specifications, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.18 Responsiveness. A responsive bid shall substantially conform to the requirements of this Invitation to Bid and/or specifications contained herein. Bidders who substitute any other terms, conditions, specifications and/or requirements or who qualify their bids in such a manner as to nullify or limit their liability to the contracting entity shall have their bids deemed non-responsive. Also, bids containing any clause that would limit contracting authority shall be considered non-responsive. Examples of non-responsive bids include but shall not be limited to: a) bids that fail to conform to required delivery schedules as set forth in the bid request; b) bids with prices qualified in such a manner that the bid price cannot be determined, such as with vague wording that may include "price in effect at the time of delivery," and c) bids made contingent upon award of other bids currently under consideration.

1.19 Responsible Standing of Bidder. To be considered for award, bidder must at least: have the ability to obtain adequate financial resources, be able to comply with required or proposed

delivery/completion schedule, have a satisfactory record of performance; have a satisfactory record of integrity and ethics, and be otherwise qualified and eligible to receive award.

1.20 Proprietary Data. Bidder may, by written request, indicate as confidential any portion(s) of a bid that contain proprietary information, including manufacturing and/or design processes exclusive to the vendor. Jefferson County will protect from public disclosure such portions of a bid, unless directed otherwise by legal authority, including existing Open Records Acts.

1.21 Public Bid Opening. Bidders are invited to be present at the opening of bids. After the official opening of bids, a period of not less than one week is necessary to evaluate bids. The amount of time necessary for bid evaluation may vary and is determined solely by the County. Following the bid evaluation, all bids submitted are available for public review.

2. Performance

2.1 Design, Strength, and Quality. Design, strength, and quality of materials and workmanship must conform to the highest standards of manufacturing and engineering practices. The apparent silence of specifications and/or plans as to any detailed description concerning any point shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications and/or plans shall be made on the basis of this statement.

2.2 Age and Manufacture. All tangible goods being bid must be new and unused, unless otherwise specified, in first-class condition, of current manufacture, and furnished ready to use. All items not specifically mentioned that are required for a complete unit shall be furnished.

2.3 Delivery Location. All deliveries will be made to the address(es) specified on the purchase order during normal working hours of 8:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise authorized by the Purchasing Agent or designee.

2.4 Delivery Schedule. Delivery time may be an important consideration in the evaluation of best value. The maximum number of days necessary for delivery ARO shall be stated in the space, if provided, on the bid form.

2.5 Delivery Charges. All delivery and freight charges, F.O.B. destination shown on Jefferson County purchase order, as necessary to perform contract are to be included in the bid price.

2.6 Installation Charges. All charges for assembly, installation and set-up shall be included in the bid price. Unless otherwise stated, assembly, installation and set-up will be required.

2.7 Operating Instructions and Training. Clear and concise operating instructions and descriptive literature will be provided in English, if requested. On-site detailed training in the safe and efficient use and general maintenance of item(s) purchased shall be provided as needed at the request of Jefferson County. Instructions and training shall be at no additional cost to the County.

2.8 Storage. Bidder agrees to provide storage of custom ordered materials, if requested, for up to thirty (30) calendar days.

2.9 Compliance with Federal, State, County, and Local Laws. Bids must comply with all federal, state, county and local laws, including, but not limited to, all applicable standard safety, emission, and noise control requirements. Any vehicles or equipment shall contain all standard safety, emission, and noise control requirements required for the types and sizes of equipment at the time of their manufacture. The contractor agrees, during the performance of work or service, to comply with all applicable codes and ordinances of Jefferson County or the State of Texas as they may apply, as these laws may now read, or as they may hereafter be changed or amended.

2.10 OSHA. The bidder will certify all equipment complies with all regulations and conditions stipulated under the Williams-Steiger Occupational Safety and Health Act of 1971, as amended. The successful bidder will further certify that all items furnished under this project will conform and comply with federal and State of Texas OSHA standards. The successful bidder will agree to indemnify and hold harmless Jefferson County for any and all damages that may be assessed against the County.

2.11 Patents and Copyrights. The successful vendor agrees to protect the County from claims involving infringements of patents and/or copyrights.

2.12 Samples, Demonstrations and Testing. At Jefferson County's request and direction, bidder shall provide product samples and/or testing of items bid to ensure compliance with specifications. Samples, demonstrations and/or testing may be requested at any point prior to or following bid award. Samples, demonstrations and/or testing may be requested upon delivery and/or any point during the term of resulting contract. All samples (including return thereof), demonstrations, and/or testing shall be at the expense of the bidder/vendor.

2.13 Acceptability. All articles enumerated in the bid shall be subject to inspection by an officer designated for that purpose by Jefferson County. If found inferior to the quality called for, or not equal in value to the specifications, deficient in workmanship or otherwise, this fact shall be certified to the Purchasing Agent, who shall have the right to reject the whole or any part of the same. Items and/or work determined to be contrary to specifications must be replaced at the vendor's expense. Inferior items not retrieved by the vendor within thirty (30) calendar days, or an otherwise agreed upon time, shall become the property of the County. If disposal of such items warrants an expense, an amount equal to the disposal expense will be deducted from amounts payable to the vendor.

2.14 Maintenance. Maintenance required for equipment bid should be available in Jefferson County by a manufacturer authorized maintenance facility. Cost for this service shall be shown on the bid sheet as requested or on a separate sheet, as required. If Jefferson County opts to include maintenance, it shall be so stated in the purchase order and said cost will be included. Service will commence only upon expiration of applicable warranties and should be priced accordingly.

2.15 Material Safety Data Sheets. Under the "Hazardous Communications Act," common known as the "Texas Right to Know Act," a bidder must provide the user department, with each delivery, material safety data sheets which are applicable to hazardous substances defined in the Act. Failure of the bidder to furnish this documentation, will be cause to reject any bid applying thereto.

2.16 Evaluation. Evaluation shall be used as a determinant as to which services are the most efficient and/or most economical for the County. It shall be based on all factors having a bearing on price and performance of the items in the user environment. All bids are subject to tabulation by the Jefferson County Purchasing Department and recommendation to Jefferson County Commissioners' Court. Compliance with all bid requirements and needs of the using department are considered in evaluating bids. Pricing is not the only criteria for making a recommendation. The Jefferson County Purchasing Department reserves to right to contact any bidder, at any time, to clarify, verify or requirement information with regard to this bid.

3. Purchase Orders and Payment

3.1 Purchase Orders. A purchase order(s) shall be generated by the Jefferson County Purchasing Agent to the successful vendor. The purchase order number must appear on all itemized invoices and packing slips. The County will not be held responsible for any work orders placed and/or performed without a valid current purchase order number. Payment will be made for all ser-

vices rendered and accepted by the contract administrator for which a valid invoice has been received.

3.2 Invoices. All invoices shall reference the Purchase Order number. Invoices shall reference the bid item number or a detailed description for each item invoiced. If an item purchased and itemized on the invoice does not correspond to an item in any of the categories awarded to the vendor, invoice shall reference the item as "N/C" to indicate that it is a non-contract item. This requirement is to assist the County in verifying contract pricing on all invoices. Payment will be made under terms of net thirty (30) days unless otherwise agreed upon by seller and the purchasing department.

3.3 Prompt Payment. In accordance with the State of Texas Prompt Payment Act, Article 601f V.T.C.S., payment will be made after receive and acceptance by the County of the merchandise ordered and of a valid invoice. Successful bidder(s) is required to pay subcontractors within ten (10) days after the successful bidder receives payment from the County.

3.4 Funding. Jefferson County is operated and funded on an October 1 to September 30 basis; accordingly, the County reserves the right to terminate, without liability to the County, any contract for which funding is not available.

4. Contract

4.1 Contract Definition. The General Conditions of Bidding and Terms of Contract, Specifications, Plans, Bidding Forms, Addenda, and any other documents made a part of this bid shall constitute the complete bid. This bid, when duly accepted by Jefferson County, shall constitute a contract equally binding between the successful bidder and Jefferson County.

4.2 Change Order. No different or additional terms will become part of this contract with the exception of a change order. No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing and at the discretion and approval of Jefferson County. No change order will be binding unless signed by an authorized representative of the County and the vendor.

4.3 Price Re-determination. A price re-determination may be requested at the time of annual renewal. All requests for price re-determination shall be in written form. Cause for such request, i.e., manufacturer's direct cost, postage rates, Railroad Commission rates, Federal/State minimum wage law, Federal/State unemployment taxes, F.I.C.A, Insurance Coverage Rates, etc., shall be substantiated in writing by the source of the cost increase. The bidder's past experience of honoring contracts at the bid price will be an important consideration in the evaluation of the lowest and best bid. Jefferson County reserves the right to accept or reject any/all requests for price re-determination as it deems to be in the best interest of the County.

4.4 Termination. Jefferson County reserves the right to terminate the contract for default if the bidder breached any of the terms therein, including warranties of bidder or if the bidder becomes insolvent or commits acts of bankruptcy. Such right of termination is in addition to and not in lieu of any other remedies which Jefferson County may have in law or equity. Default may be construed as, but not limited to, failure to deliver the proper goods and/or service within the proper amount of time, and/or to properly perform any and all services required to Jefferson County's satisfaction and/or to meet all other obligations and requirements. Contracts may be terminated without cause upon thirty (30) days' written notice to either party unless otherwise specified. Jefferson County reserves the right to award canceled contract to the next lowest bidder. Bidder, in submitting this

bid, agrees that Jefferson County shall not be liable to prosecution for damages in the event that the County declares the bidder in default.

4.5 Conflict of Interest. Employees of the County are not permitted to maintain financial interest in, or receive payment, directly or indirectly, borrow from, lend to, invest in, or engage in any substantial financial transaction with any individual, organization, supplier, or subcontractor who does business with the County without disclosure. When conflict of interest is discovered, it shall be grounds for termination of contract.

4.6 Injuries or Damages Resulting from Negligence. Successful vendor shall defend, indemnify and save harmless Jefferson County and all its officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful vendor, or of any agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from bid award. Successful vendor shall pay any judgment with cost which may be obtained against Jefferson County growing out of such injury or damages.

4.7 Interest by Public Officials. No public official shall have interest in this contract, in accordance with Texas Local Government Code.

4.8 Warranty. The successful vendor shall warrant that all materials utilized in the performance of this contract shall conform to the proposed specifications and/or all warranties as stated in the Uniform Commercial Code and be free from all defects in material, workmanship and title.

4.9 Uniform Commercial Code. The successful vendor and Jefferson County agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

4.10 Venue. This agreement will be governed and construed according to the laws of the State of Texas. This agreement is performable in the County of Jefferson, Texas.

4.11 Sale, Assignment, or Transfer of Contract. The successful vendor shall not sell, assign, transfer or convey this contract, in whole or in part, without the prior written consent of Jefferson County.

4.12 Silence of Specifications. The apparent silence of these specifications as to any detailed description concerning any point, shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

Special Requirements/Instructions

The following requirements and instructions supersede General Requirements where applicable.

1. Bid Requirement

Each bidder shall ensure that required parts of the bid are completed with accuracy and submitted as per the requirements within this specifications packet, including any addenda.

Bidder is responsible for submitting one (1) *original* bid copy to include a completed copy of this specifications packet in its entirety; and three (3) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked "SEALED BID." The outside of the envelope or box shall also include: Bid Number, Bid Name, Bid Due Date, Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Jefferson County shall not be responsible for any effort or cost expended in the preparation of a response to this IFB. All protests should be coordinated through the Purchasing Office prior to award recommendation to Commissioners' Court.

2. Vendor Registration: SAM (System for Award Management).

Vendors doing business with Jefferson County are **required** to be registered with The System for Award Management (SAM), with an "active" status. The System for Award Management (SAM) is the Official U.S. Government system that consolidated the capabilities of CCR/FedReg, ORCA, and EPLS. There is NO fee to register for this site. Entities may register at no cost directly from the SAM website at: https://www.sam.gov

Bid Respondents are strongly encouraged to review their firm's SAM (System for Award Management) status prior to Bid Submission.

3. Awarded Vendor(s): Submission of FORM 1295 (Texas Ethics Commission)

As of January 1, 2016, per House Bill 1295, the Texas Ethics Commission (TEC) requires **all awarded vendors** to complete a Certificate of Interested Parties (FORM 1295) at time of notification of award. **Awarded Vendors** must visit the TEC website link below, enter the required information on Form 1295, and print a copy of the completed form. The form will include a certification of filing that will contain a unique certification number.

At the time of award, the Jefferson County Purchasing Department will submit a request to the Awarded Vendor to both:

1. Submit FORM 1295 online via the Texas Ethics Commission website link below.

2. Submit a printed copy of FORM 1295, signed by an Authorized Agent of the Awarded Vendor and notarized to the Jefferson County Purchasing Department.

FORM 1295, Completion Instructions, and Login Instructions are available via the Texas Ethics Commission Website at: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

4. Multiple Vendor Award

Jefferson County reserves the right to award this contract to more than one vendor at the County's discretion.

5. Delivery

If delivery is required, all items must be packaged so as to be protected from damage during shipping and handling. Any item(s) damaged in shipping must be replaced in kind, or repaired, by the contractor, at the discretion of, and at no additional charge to, Jefferson County.

6. Payment

Jefferson County will pay original invoices that clearly itemize the goods and/or services provided as to quantity, part number, description, price, applicable discount (if any), labor charges showing time differential, if applicable and if previously agreed to, and delivery, installation, and set-up costs, if applicable and if previously agreed to. Only charges as stated on the Bid Form(s) submitted as a part of the bid will be considered.

Invoices must indicate Jefferson County as applicable, the address to which the product(s) and/or service(s) were delivered, and the applicable purchase order number. Invoices will be matched to delivery tickets prior to payment; therefore, all delivery tickets should have an accurate description of the product(s) and/or service(s).

Invoices shall be submitted to: Jefferson County Auditing Department, Attention: Accounts Payable, 1149 Pearl Street, 7th floor, Beaumont, TX 77701.

7. Usage Reports

Jefferson County reserves the right to request, and receive at no additional cost, up to two (2) times during the contract period, a usage report detailing the products and/or services furnished to date under a contract resulting from this IFB. The reports must be furnished no later than five (5) working days after written request and itemize all purchases to date by Jefferson County department, description of each item purchased, including manufacturer, quantity of each item purchased, per unit and extended price of each item purchased, and total amount and price of all items purchased.

8. Insurance

The contractor (including any and all subcontractors as defined in Section 9.1.3 below) shall, at all times during the term of this contract, maintain insurance coverages with not less than the type and requirements shown below. Such insurance is to be provided at the sole cost of the contractor. These requirements do not establish limits of the contractor's liability.

All policies of insurance shall waive all rights of subrogation against the County, its officers, employees and agents; a copy of the policy wording or endorsement is required.

Contractor shall furnish Jefferson County with Certificate of Insurance naming Jefferson County as additional insured and will provide the actual policy wording or endorsement showing as such.

All insurance must be written by an insurer licensed to conduct business in the State of Texas.

Minimum Insurance Requirements

Public Liability, including Products & Completed Operations	$1,000,000
Excess Liability	$1,000,000

Property Insurance (policy below that is applicable to this project):

Improvements & Betterments Policy: Improvements/Remodeling (for Lease Tenants)
Builder's Risk Policy: Structural Coverage for Construction Projects
Installation Floater Policy: Improvements/Alterations to Existing Structure

Workers' Compensation	Statutory Coverage (see attached)

9. Workers' Compensation Insurance

9.1 Definitions:

9.1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

9.1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

9.1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly

with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

9.2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

9.3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Section 8 above.

9.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

9.5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

9.5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

9.5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

9.6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

9.7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

9.8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on

the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9.9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 9.1. – 9.7., with the certificates of coverage to be provided to the person for whom they are providing services.

9.10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

9.11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

Bidder Information Form

Instructions: Complete the form below. Please provide legible, accurate, and complete contact information. PLEASE PRINT.

Bid Name & Number: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport (IFB 17-024/JW)

Bidder's Company/Business Name: ALLCO

Bidder's TAX ID Number: 76-0685119

Contact Person: BRANDON HARRISON **Title:** PROJECT MANAGER

Phone Number (with area code): 409-860-4459

Alternate Phone Number if available (with area code): 409-790-9464

Fax Number (with area code): 409-860-3857

Email Address: bharrison@allco.com

Mailing Address (Please provide a physical address for bid bond return, if applicable):

PO BOX 3684 (physical: 6720 College, Beaumont, TX 77707)
Address

BEAUMONT, TEXAS 77704
City, State, Zip Code

OFFER AND ACCEPTANCE FORM

OFFER TO CONTRACT

To Jefferson County:

We hereby offer and agree to furnish the materials or service in compliance with all terms, conditions, specifications, and amendments in the Invitation for Bid and any written exceptions in the offer. We understand that the items in this Invitation for Bid, including, but not limited to, all required certificates are fully incorporated herein as a material and necessary part of the contract.

The undersigned hereby states, under penalty of perjury, that all information provided is true, accurate, and complete, and states that he/she has the authority to submit this bid, which will result in a binding contract if accepted by Jefferson County.

We acknowledge receipt of the following amendment(s): 1, 2, 3, _____.

I certify, under penalty of perjury, that I have the legal authorization to bind the firm hereunder:

ALLCO
Company Name

PO BOX 3684
Address

BEAUMONT, TEXAS 77704
City State Zip

Signature of Person Authorized to Sign

T.W. HARRISON
Printed Name

PRESIDENT
Title

For clarification of this offer, contact:

BRANDON HARRISON
Name

409-860-4459 409-860-3857
Phone Fax

bharrison@allco.com
E-mail

ALLCO, L.L.C. TEXAS

Bidder Shall Return Completed Form with Offer.

SECTION C
BID FORM AND PROPOSAL

BID FORM AND PROPOSAL

Place BEAUMONT, TEXAS

Date AUGUST 8, 2017

Proposal of ALLCO,

a corporation organized and existing under the laws of the State of TEXAS,

or

Proposal of _____,

a partnership consisting of _____

or

Proposal of _____,

an individual doing business as _____,

To: Jack Brooks Regional Airport

This bid results from your advertisement for bids for the construction of the **Taxiway D Reconstruction (2017), Ware Ramp to Taxiway 'F'.**

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents including all Addenda, and being familiar with all of the conditions relating to the construction of the proposed project, hereby agrees to comply with all other conditions or requirements set forth in the Plans, Specifications, and other Contract Documents, and further proposes to; furnish all material, supplies, equipment, and appliances; to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Plans, Specifications, and other Contract Documents at and for the unit prices proposed in the attached Bid Form(s).

The undersigned Bidder agrees to begin work within ten (10) calendar days after the issuance by, or on behalf of, the Owner of a "Work Order" or "Notice to Proceed" (except as modified in accordance with the GENERAL FAA PROVISIONS of these Contract Documents). Should the work fail to be completed within the time herein stated, the Contractor shall pay to the Owner, as fixed and agreed liquidated damages, and not as a penalty, the sum, for each day of delay until the work is completed and accepted, as stipulated in GENERAL FAA PROVISIONS of these Contract Documents. It is understood that additional time for the completion of the project is to be allowed only for delays as stipulated in GENERAL FAA PROVISIONS of these Contract Documents.

List of Plans

Drawing No.	Title
G-101	COVER SHEET
G-102	SHEET INDEX AND SUMMARY OF QUANTITIES
G-103	GENERAL NOTES
G-201	PROJECT LAYOUT AND SURVEY CONTROL PLAN
G-301	SAFETY AND PHASING PLAN
G-302	SAFETY AND PHASING DETAILS
G-303	SAFETY AND PHASING - PHASE I

Drawing No.	Title
G-304	SAFETY AND PHASING - PHASE II
G-305	SAFETY AND PHASING - PHASE III
G-401	GEOTECHNICAL INVESTIGATION PLAN
C-101	TYPICAL SECTIONS
C-201	SWPPP DETAILS I
C-202	SWPPP DETAILS II
C-203	SWPPP NOTES
C-204	SWPPP LAYOUT
C-301	EXISTING CONDITIONS LAYOUT I
C-302	EXISTING CONDITIONS LAYOUT II
C-401	DEMOLITION DETAILS
C-402	DEMOLITION LAYOUT
C-501	GRADING AND DRAINAGE DETAILS I
C-502	GRADING AND DRAINAGE DETAILS II
C-503	GRADING AND DRAINAGE PLAN I
C-504	GRADING AND DRAINAGE PLAN II
C-601	STORM DRAIN PROFILES AND CALCULATIONS I
C-701	GEOMETRIC PLAN I
C-702	GEOMETRIC PLAN II
C-801	PAVEMENT PROFILE I
C-802	PAVEMENT PROFILE II
C-901	JOINTING DETAILS
C-902	JOINT LAYOUT PLAN I
C-903	JOINT LAYOUT PLAN II
C-1001	JOINT ELEVATIONS LAYOUT I
C-1002	JOINT ELEVATIONS LAYOUT II
M-101	MARKING DETAILS
M-102	MARKING REMOVAL PLAN I
M-103	MARKING REMOVAL PLAN II
M-103	MARKING AND SIGNAGE LAYOUT I
M-104	MARKING AND SIGNAGE LAYOUT II
XS-101	TAXIWAY D CROSS SECTIONS I
XS-102	TAXIWAY D CROSS SECTIONS II
XS-103	TAXIWAY D CROSS SECTIONS III
XS-104	TAXIWAY D CROSS SECTIONS IV
XS-105	TAXIWAY D CROSS SECTIONS V
XS-106	TAXIWAY D CROSS SECTIONS VI
XS-107	TAXIWAY D CROSS SECTIONS VII
XS-108	TAXIWAY D CROSS SECTIONS VIII
XS-109	TAXIWAY D CROSS SECTIONS IX
XS-110	TAXIWAY D CROSS SECTIONS X
XS-111	TAXIWAY D CROSS SECTIONS XI
E-001	ELECTRICAL LEGEND AND NOTES
E-101	LIGHTING REMOVAL PLAN I
E-102	LIGHTING REMOVAL PLAN II

Drawing No.	Title
E-201	LIGHTING INSTALLATION PLAN I
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

Bidder acknowledges receipt of the following addendum (addenda):

Addendum No. ONE dated 7-25-17

Addendum No. TWO dated 8-02-17

Addendum No. THREE dated 8-04-17

The undersigned Bidder agrees that this bid shall be good and shall not be withdrawn for a period of ninety (90) calendar days after the opening thereof. If written notice of the acceptance of this Proposal is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the opening thereof, or at any time thereafter before this Proposal is withdrawn, the undersigned agrees to execute and deliver an Agreement (Contract) in the prescribed form, and furnish the required Performance and Payment Bond, within ten (10) days after the Agreement is presented to him for signature.

It is understood by the undersigned Bidder that the Owner reserves the right to reject any or all bids.

The following provisions are also included by reference:

- Davis Bacon Act (29 CFR Part 5.5)
- EEO Compliance Reports (41 CFR Part 60-1.7)
- Trade Restriction Certification (49 CFR Part 30)
- Buy American Preferences (Title 49 United States Code, Chapter 501)
- Certification of Non-Segregated Facilities (41 CFR Part 60-1.8)
- Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion (49 CFR Part 29)

Accompanying this Proposal as bid security is a ~~certified check/~~bid bond (*strike one*)

in the amount of **FIVE PERCENT OF GREATEST AMOUNT BID********** Dollars

($ 5% GAB*********), being not less than five percent (5%) of the total amount of the bid for the base bid plus additive alternate no. 1 and additive alternate no. 2, as applicable. If the undersigned Bidder is the successful Bidder, but fails or refuses to execute the contract and furnish the required bond within the prescribed ten (10) days of the notification of award, then this bid security is to become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure or refusal.

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$147,400.00	$ 147,400.00
	Unit price in words: One Hundred Forty Seven Thousand Four Hundred dollars and No ——— /100				
SS-120-1	SITE PREPARATION	L.S.	1	$112,500.00	$ 112,500.00
	Unit price in words: One Hundred Twelve Thousand Five Hundred dollars and No ——— /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$5,500.00	$ 5,500.00
	Unit price in words: Five Thousand Five Hundred dollars and No ——— /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$ 5.25	$ 26,250.00
	Unit price in words: Five ——— dollars and Twenty Five /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$575.00	$ 575.00
	Unit price in words: Five Hundred Seventy Five dollars and No ——— /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$ 575.00	$ 1,725.00
	Unit price in words: Five Hundred Seventy Five dollars and No ——— /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$ 170.00	$ 12,070.00
	Unit price in words: One Hundred Seventy — dollars and No ——— /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$ 220.00	$ 440.00
	Unit price in words: Two Hunded Twenty ——— dollars and No ——— /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$ 245.00	$ 245.00
	Unit price in words: Two Hunded Forty Five — dollars and No ——— /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$ 220.00	$ 220.00
	Unit price in words: Two Hundred Twenty ——— dollars and No ——— /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$ 210.00	$ 210.00
	Unit price in words: Two Hundred Ten ——— dollars and No ——— /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$ 1,100.00	$ 1,100.00
	Unit price in words: One Thousand One Hundred dollars and No ——— /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$ 86.00	$ 344.00
	Unit price in words: Eighty Six ——— dollars and No ——— /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$ 212.00	$ 4,028.00
	Unit price in words: Two Hundred Twelve dollars and No /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$ 238.00	$ 952.00
	Unit price in words: Two Hundred Thirty Eight dollars and No /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$ 0.50	$ 325.00
	Unit price in words: Zero dollars and Fifty /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$ 51.00	$ 20,400.00
	Unit price in words: Fifty One dollars and No /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 5,100.00	$ 20,400.00
	Unit price in words: Five Thousand One Hunded dollars and No /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 6,600.00	$ 26,400.00
	Unit price in words: Six Thousand Six Hundred dollars and No /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$ 1,010.00	$ 75,750.00
	Unit price in words: One Thousand Ten dollars and No /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$ 4,100.00	$ 4,100.00
	Unit price in words: Four thousand One Hundred dollars and No ——— /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$ 760.00	$ 3,800.00
	Unit price in words: Seven Hundred Sixty — dollars and No ——— /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$ 6,400.00	$ 6,400.00
	Unit price in words: Six thousand Four Hunded dollars and No ——— /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$ 70.00	$ 19,250.00
	Unit price in words: Seventy ——— dollars and No ——— /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$ 2,750.00	$ 2,750.00
	Unit price in words: Two thousand Seven Hundred Fifty dollars and No ——— /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$ 6,000.00	$ 6,000.00
	Unit price in words: Six thousand ——— dollars and No ——— /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$ 17.00	$ 312,035.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Seventeen dollars and No /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$10.00	$42,390.00
	Unit price in words: Ten dollars and no /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$21.00	$47,250.00
	Unit price in words: Twenty-one dollars and no /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$34.00	$187,000.00
	Unit price in words: Thirty-four dollars and no /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$25.00	$18,750.00
	Unit price in words: Twenty-five dollars and no /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$26.00	$394,472.00
	Unit price in words: Twenty Six dollars and No /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$19.00	$307,021.00
	Unit price in words: Nineteen dollars and no /100				
P-155-2	LIME	TON	600	$199.25	$119,550.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: One Hundred Ninety Nine ——— dollars and twenty-five ——/100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$16,500.20	$16,500.20
	Unit price in words: Sixteen Thousand Five Hundred ——— dollars and twenty ——— /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$104.00	$1,493,336.00
	Unit price in words: One Hundred Four ——— dollars and NO ——— /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$6.43	$9,645.00
	Unit price in words: Six ——— dollars and forty-three —/100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$420	$11,130.00
	Unit price in words: Four ——— dollars and twenty ——/100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$3.20	$13,760.00
	Unit price in words: Three ——— dollars and twenty ——/100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$10,250.00	$10,250.00
	Unit price in words: Ten Thousand Two Hundred Fifty dollars and no ——— /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$3.50	$65,229.50

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Three dollars and fifty /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$2,582.00	$19,106.80
	Unit price in words: Two Thousand Five Hundred Eighty-Two dollars and no /100				
T-904-1	SODDING	S.Y.	1,405	$10.50	$14,752.50
	Unit price in words: Ten dollars and fifty /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$1.25	$45,708.75
	Unit price in words: One dollars and twenty-five /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$9,300.00	$9,300.00
	Unit price in words: Nine Thousand Three Hundred dollars and no /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$16,000.00	$16,000.00
	Unit price in words: Sixteen Thousand dollars and no /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$6.00	$1,800.00
	Unit price in words: Six dollars and no /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$1.30	$19,760.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: One dollars and thirty /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$ 1.30	$ 8,450.00
	Unit price in words: One dollars and thirty /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$ 3.25	$ 1,137.50
	Unit price in words: Three dollars and twenty-five /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$ 2.60	$ 14,560.00
	Unit price in words: Two dollars and Sixty /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$ 1.50	$ 225.00
	Unit price in words: One dollars and fifty /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$ 1.45	$ 108.75
	Unit price in words: One dollars and forty-five /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$ 8.60	$ 48,160.00
	Unit price in words: Eight dollars and Sixty /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$ 11.00	$ 770.00
	Unit price in words: Eleven dollars and no /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$ 11.00	$ 2,475.00
	Unit price in words: Eleven dollars and no /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$ 72.00	$ 19,800.00
	Unit price in words: Seventy-two dollars and no /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$ 57.00	$ 7,125.00
	Unit price in words: Fifty-Seven dollars and no /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700	$ 90.00	$ 63,000.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Ninety dollars and no /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$800.00	$1,600.00
	Unit price in words: Eight Hundred dollars and no /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$890.00	$7,120.00
	Unit price in words: Eight Hundred Nnety dollars and no /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$3,900.00	$3,900.00
	Unit price in words: Three Thousand Nine Hundred dollars and no /100				

TOTAL (BASE BID) $3,852,312.00

Total price in words: Three Million Eight Hundred Fifty Two Thousand Three Hundred Twelve dollars and No /100

It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

Bid Affidavit

The undersigned certifies that the bid prices contained in this bid have been carefully reviewed and are submitted as correct and final. Bidder further certifies and agrees to furnish any and/or all commodities upon which prices are extended at the price offered, and upon the conditions contained in the specifications and the Notice to Bidders.

STATE OF TEXAS COUNTY OF JEFFERSON

BEFORE ME, the undersigned authority, a Notary Public in and for the State of TEXAS,

on this day personally appeared T.W. HARRISON (name), who

after being by me duly sworn, did depose and say:

"I, T.W. HARRISON (name) am a duly authorized officer of/agent

for ALLCO (name of firm) and have been duly authorized to execute the

foregoing on behalf of the said ALLCO (name of firm).

I hereby certify that the foregoing bid has not been prepared in collusion with any other bidder or other person or persons engaged in the same line of business prior to the official opening of this bid. Further, I certify that the bidder is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities bid on, or to influence any person or persons to bid or not to bid thereon."

Name and address of bidder: ALLCO

PO BOX 3684, BEAUMONT, TEXAS 77704

Fax: 409-860-3857 Telephone# 409-860-4459

by: T.W. HARRISON (print name) Title: PRESIDENT

Signature:

ALLCO, L.L.C. TEXAS

SUBSCRIBED AND SWORN to before me by the above-named T.W. HARRISON on

this the 8TH day of AUGUST, 2017.

JACQUELINE CHRISTOPHER
Notary Public, State Of Texas
Comm. Expires 05-21-2020
My Notary ID # 155932-5

Notary Public in and for the State of TEXAS

Bidder Shall Return Completed Form with Offer.

SECTION D
STATEMENT OF BIDDER'S QUALIFICATIONS

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder ALLCO.
2. Permanent main office address
   (physical: 6720 College, Beaumont, TX 77707)
   (mailing: PO BOX 3684, Beaumont, TX 77704)
3. When organized APRIL 22, 1985.
4. If a corporation, where incorporated TEXAS.
5. How many years have been engaged in the contracting business under your present firm or trade name? 32 YEARS
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion)
   PLEASE SEE ATTACHED.

General character of work performed by your company GENERAL CONTRACTOR (see attached details)

7. Have you ever failed to complete any work awarded to you? NO
8. Have you ever defaulted on a Contract? NO
   If so, where and why?
9. Have you ever been fined or had your license suspended by a Contractor's Licensing Board? NO
   If so, where and why?
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed (attach to back of this document). PLEASE SEE ATTACHED.
11. List your major equipment available for this Contract (attach to back of this document). PLEASE SEE ATTACHED.
12. List your experience in construction work similar in scope and scale to this project (attach to back of this document). PLEASE SEE ATTACHED.
13. Background and experience of the principal members of your organization, including the officers (attach to back of this document). WE WILL SUBMIT IF SUCCESSFUL BIDDER.
14. Credit available: $ N/A
15. Give Bank reference: COMMUNITY BANK

ALLCO
LIST OF PROJECTS NOW ENGAGED IN COMPLETING

Contract Amount	Class of Work	Percent Completed	Where Located City/County/State	Owner or Owner Representative
15,990,000	New High School Buna Independent School District	97%	Buna Jasper Texas	Architectural Alliance 350 Pine Street Ste. 720 Beaumont Texas 77701 409-866-7196
5,600,000	Crenshaw Water Plant Ground Storage Tank	99%	Pasadena Harris Texas	City of Pasadena 1114 Davis Street Ste. 300 Pasadena Texas 77506 713-475-4995
12,605,000	Surface Water Treatment Plant Improvements Phase I	93%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
7,950,000	Water Treatment Plant Lake Livingston Water & Sewer Service Corp	99%	Livingston Polk Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
50,000,000	Alligator Bayou Pump Station Annex-Drainage District No. 7	60%	Port Arthur Jefferson Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
300,000	Site Grading Port Arthur Business Park	99%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
191,000,000	Textile Manufacture Facility	0%	Port Arthur Jefferson Texas	Pure Renewable Systems 6712 E. 118 Street Bixby Oklahoma 74008 918-406-2557
2,690,000	Port Acres Wastewater Treatment Plant Improvements	95%	Port Acres Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888

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LIST OF PROJECTS NOW ENGAGED IN COMPLETING

Contract Amount	Class of Work	Percent Completed	Where Located City/County/State	Owner or Owner Representative
2,200,000	City of Anahuac Wastewater Treatment Plant Rehab ContractA	70%	Anahuac Chambers Texas	Carroll & Blackman 3120 Fannin Street Beaumont Texas 77702 409-833-3363
1,300,000	City of Rose City Bridges Project #2	95%	Rose City Orange Texas	Goodwin Lasiter 1609 S. Chestnut Ste. 202 Lufkin Texas 75901 936-637-6336
740,000	Asphalt Road Repairs Rosen & Various Streets City of Bridge City	90%	Bridge City Orange Texas	Action Engineers 8460 Central Mall Dr. Ste. J Port Arthur Texas 77642 409-983-6263
23,750,000	Surface Water Treatment Plant Improvements Phase 2	60%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. Ste. 320 Port Arthur Texas 77642 409-724-7888
3,260,000	Jack Brooks Regional Airport Runway Reconstruction	99%	Beaumont Jefferson Texas	Garver USA C/O 1149 Pearl Street Beaumont Texas 77701 713-491-8333
2,861,000	Wastewater Treatment Plant Expansion Phase 2A & 2B	20%	Orange Orange Texas	Schaumburg & Polk 8865 College Street Beaumont Texas 77707 409-866-0341

ATTACHMENT TO AIA FORM A305
CONTRACTOR'S QUALIFICATION STATEMENT

Experience .

I. Commercial Building Construction and Management

- A. Earthwork
- B. Site Drainage Work
- C. Concrete Foundations
- D. Concrete Paving and Walks
- E. Concrete Tilt Panels
- F. Steel and Panel Erection
- G. Rough and Finish Carpentry

II. Civil Construction

- A. Site Clearing
- B. Drainage Work
- C. Roads and Paving
- D. Bridges
- E. Wetlands and Ponds

III. Water/Wastewater Treatment Facilities

- A. Earthwork
- B. Concrete Foundations
- C. Concrete Structures
- D. Steel Erection
- E. Equipment Setting
- F. Painting
- G. Site Drainage
- H. Piping

IV. Utility

- A. Water Lines, Sewer Lines & Storm Water Drainage Installation
- B. Rehabilitation of Sanitary Sewer/Storm Sewer
  1. Point Repairs
  2. Sliplining
  3. Pipe Bursting
- C. Lift Stations

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
2,690,000	Port Acres Wastewater Treatment Plant Improvements	2016	Port Acres Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
3,260,000	Jack Brooks Regional Airport Runway Reconstruction	2016	Beaumont Jefferson Texas	Garver USA C/O 1149 Pearl Street Beaumont Texas 77701 713-491-8333
300,000	Site Grading Port Arthur Business Park	2016	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
740,000	Asphalt Road Repairs Rosen & Various Streets City of Bridge City	2016	Bridge City Orange Texas	Action Engineers 8460 Central Mall Dr. Ste. J Port Arthur Texas 77642 409-983-6263
1,300,000	City of Rose City Bridges Project #2	2016	Rose City Orange Texas	Goodwin Lasiter 1609 S. Chestnut Ste. 202 Lufkin Texas 75901 936-637-6336
5,600,000	Crenshaw Water Plant Ground Storage Tank	2016	Pasadena Harris Texas	City of Pasadena 1114 Davis Street Ste. 300 Pasadena Texas 77506 713-475-4995
7,950,000	Water Treatment Plant Lake Livingston Water & Sewer Service Corp	2016	Livingston Polk Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
12,900,000	South Park Drainage Relief Project	2015	Beaumont Jefferson Texas	City of Beaumont 801 Main Street Beaumont Texas 77701 409-880-3725
1,407,000	Water & Sewer Rehab South Park Area	2015	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-735-3000

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
1,612,000	Coopers Gully Pump Station - City of Orange	2015	Orange Orange Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
3,400,000	Water System Improv. Keith Lake to Sabine Pass Standpipe	2015	Port Arthur Jefferson Texas	Arceneaux & Gates 2901 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
1,130,000	Wastewater Treatment Plant Improvements Phase IA & IB	2015	Orange Orange Texas	Schaumburg & Polk 8865 College Street Beaumont Texas 77707 409-866-0341
3,200,000	24" Waterline City of Port Arthur-19th St. to Sabine Neches Canal	2015	Port Arthur Jefferson Texas	Arceneaux & Gates 2901 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
3,492,000	Sanitary Sewer Impr 54" Interceptor	2015	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
1,750,000	Wastewater Collection Rehabilitation	2015	Nederland Jefferson Texas	Schaumburg & Polk Inc. 8865 College Street Beaumont Texas 77707 409-866-0341
3,350,000	Detention Ponds & Drainage Facilities Imperial Phase II	2015	Sugarland Fort Bend Texas	LJA Engineers 2929 Briarpark Houston Texas 77042 713-953-520
3,350,000	Detention Ponds & Drainage Facilities Imperial Phase II	2015	Sugarland Fort Bend Texas	LJA Engineers 2929 Briarpark Houston Texas 77042 713-953-520
4,500,000	Orange County WCID #1 Cloverleaf Tiger Lake Lift Station/Force Main	2014	Vidor Orange Texas	Carroll & Blackman 3120 Fannin Beaumont Texas 77702 409-833-3363

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LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
1,800,000	City of Missouri City Prestressed Concrete Clearwell	2014	Missouri City Fort Bend Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
2,500,000	Asphalt Road Repair City Wide -Bridge City	2014	Bridge City Orange Texas	d.p. Consulting Engineers 3727 Doctors Drive Port Arthur Texas 77642 409-983-6263
430,000	Clarifier Rehabilitation	2014	Orange Orange Texas	Firestone Polymers 5713 FM 1006 Orange Texas 77630 409-924-4626
457,000	Post Office Lift Station Improvements	2014	Port Neches Jefferson Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
2,400,000	Fort Polk Sewer American Water	2014	Fort Polk Vernon Louisiana	Arceneaux & Gates 3501 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
10,000,000	Richland Chambers Wetland Expansion Improvements	2013	Fairfield Navarro Texas	Alan Plummer Associates 1349 Empire Central Ste 1000 Dallas Texas 75247 214-631-6100
2,000,000	Water System Improvements	2013	Nederland Jefferson Texas	City of Nederland 1400 Boston Avenue Nederland Texas 77627 409-723-1542
2,700,000	Sanitary Sewer 60" Trunk Outfall	2013	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
1,150,000	Asphalt Road Repair Repair City of Bridge City	2013	Bridge City Orange Texas	d.p. Consulting Engineers 3727 Doctors Dr. Port Arthur Texas 77642 409-983-6263

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
9,971,000	Main & Port Acres WWTP Rehabilitation City of Port Arthur	2012	Port Arthur Jefferson Texas	Arceneaux & Gates 2901 Turtle Creek Dr. Ste. 201 Port Arthur Texas 77642 409-724-7888
3,500,000	Sanitary Sewer Rehab Contract 6	2012	Port Arthur Jefferson Texas	City of Port Arthur P.O. Box 1089 Port Arthur Texas 77640 409-983-8226
1,700,000	Diboll Water System Northside	2012	Angelina Diboll Texas	KSA Engineers 107 W. Lufkin Avenue Lufkin Texas 75904 936-637-6061
639,000	Nacogdoches WWTP 2010 Improvements	2012	Nacogdoches Nacogdoches Texas	Schaumburg & Polk Inc. 8865 College Beaumont Texas 77707 409-866-3413
3,100,000	Sanitary Sewer Rehab 2009 Project	2012	Nederland Jefferson Texas	City of Nederland 1400 Boston Avenue Nederland Texas 77627 409-723-1542
800,000	Waterline Installation Large Diameter Main	2011	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
2,950,000	Wastewater Treatment Plant Improvements	2011	Liberty Liberty Texas	Schaumburg & Polk Inc. 8865 College Street Beaumont Texas 77707 409-866-0341
2,000,000	Water & Sewer Area II & III	2010	Orange Orange Texas	City of Orange P.O. Box 520 Orange Texas 77630 409-883-1900
1,400,000	Sanitary Sewer Rehab Project Contract XIV	2010	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000

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LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
8,500,000	Water Treatment Plant Expansion/Renovations	2010	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
4,000,000	Full Dept Concrete Repair Project	2010	Beaumont Jefferson Texas	City of Beaumont P.O. Box 3872 Beaumont Texas 77704 409-785-3000
6,700,000	Wastewater Treatment Plant Renovations	2009	Dayton Liberty Texas	O'Malley Engineers 1306 North Park Brenham Texas 77833 979-836-7937
3,200,000	Wastewater Treatment Plant Improvements	2009	Woodlands Montgomery Texas	Carter & Burgess Inc. 55 Waugh Suite 800 Houston Texas 77007 713-869-7900
25,000,000	East Fork Raw Water Supply Wetland Construction Project	2009	Wylie Collin Texas	Alan Plummer Associates 1349 Empire Centra Ste 1000 Dallas Texas 75247 214-631-6100
2,700,000	Alabama Command Control Center	2009	Orange Orange Texas	Port of Orange 1201 Childers Road Orange Texas 77630 409-883-4363
3,333,000	Water Treatment Plant Improvements Phase I	2009	Carthage Panola Texas	KSA Engineers 140 E. Tyler Suite 600 Longview Texas 75601 936-637-6061
5,500,000	Rolphe Christopher Blvd. Renovations	2009	Beaumont Jefferson Texas	City of Beaumont P.O. Box 3827 Beaumont Texas 77704 409-785-3000
3,200,000	FM 1179 Road Improvements	2008	Bryan Brazos Texas	Texas Dept of Transportation 1300 N. Texas Avenue Bryan Texas 77803 979-778-2165

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john.tomplait@portarthur.net

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ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0265	Hammer	2014	PH3	109757
0011	Television Inspection System	1995	Sprinter Demo 112	NA
0176	Skid Tank	Unk	10,000 Gallon UL 142	10244~10215
0093	Hydraulic Hammer	2001	Allied AS 380	698
0331	Arrow Board	2007	Almond Eclipse	532A807
0332	Arrow Board	2007	Almond Eclipse	533AB07
0029	Crane, Crawler	1965	American Crawler 599 w/8' of46S boom	GS9776
0345	Profilograph Machine	2016	Ames 4200	201099
0196	DROP HAMMER	1998	Arrow 1350	643 5
0117	Attachment	2004	Asphalt Zipper AZ480	48000163
0268	Air Compressor	Unk	Atlas Copco XAS 185KD	HOP050907
0269	Air Compressor	Unk	Atlas Copco XAS 185KD	HOP050914
0255	Pump	Unk	Baker Corp 6"	23912
0201	Mobile Office Trailer	Unk	Belmont Premier	16x80
0045	Paver	c2005	Bidwell 3600	B360023900
0246	Road Widener	c1972	Blaw-Knox RW-3 8	03802-14
0067	Excavator, Mini	2001	Bobcat 322	223513486
0181	Loader, Skid Steer	2006	Bobcat T190	531612221
0277	Loader, Skid Steer	2004	Bobcat T200	518918012
0207	Loader, Skid Steer	2009	Bobcat T250	A5GS3S067
0286	Compactor	1997	Bomag BW211	371095
0062	Compactor	1995	Bomag BW212D	280263
0049	Compactor	1994	Bomag BW212D	9401720
0162	Compactor	01991	Bomag BW213	241199
0288	Compactor	1 999	Bomag BW213 PDH-3	109580240201
0289	Compactor	2006	Bomag BW213 PDH-3	521007
0172	Compactor	2004	Bomag BW213 DH-3	901581511005
0050	Compactor	1997	Bomag BW213 PDH-3	109580240209V
0148	Broom	1999	Broce J R350	89670
8	Broom	1997	Broce RJ 300	88290
0293	Broom	2005	Broce RJ 3 50	404099
0217	Broom	2005	Broce R1350	404586
0032	Back Hoe	1998	Case 5801.	JJG023 8024
0035	Back Hoe	1996	Case 580L	JJG0222842
0209	Fork Lift	2000	Case 586G	JJG0291240
0118	Water Wagon	1994	Caterpillar 613C, 5000 Gallon	SLJ00962
0229	Dump, Off-Road	2004	Caterpillar 725, Articulated	AFX01064
0228	Dump, Off-Road	2004	Caterpillar 725, Articulated	AFX0l2l9
0314	Dump, Off-Road	2004	Caterpillar 725, Articulated	AFX014l2
0313	Dump, Off-Road	2005	Caterpillar 725, Articulated	B 1L003 89
0342	Dump, Off-Road	2012	Caterpillar 725, Articulated	BILO2764
0341	Dump, Off-Road	2012	Caterpillar 725, Articulated	B 1 L02733
0185	Compactor	1981	Caterpillar 815	I7Z00125
0147	Compactor	1981	Caterpillar 815	17Z1286
0082	Loader, Wheel	1986	Caterpillar 926	94Z01791
0122	Back Hoe	2001	Caterpillar 416D	BFP02353
0186	Scraper	1997	Caterpillar 621F	4SK00647
0344	Motor Grader	1985	Caterpillar 130G	7GB0l558
0002	Motor Grader	1990	Caterpillar 140 G	72V13715
0012	Excavator	1999	Caterpillar 322 BL	1YS00790
0087	Excavator	1998	Caterpillar 322 BL	2ES00434
0040	Back Hoe	1998	Caterpillar 416 CIT	1WR04063
53	Back Hoe	1999	Caterpillar 416 CIT	1WR10486

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ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0008	Back Hoe	1999	Caterpillar 416 C	4ZN07994
0061	Back Hoe	2001	Caterpillar 416 C	4ZN23379
0130	Back Hoe	1998	Caterpillar 416 C1T	IWR03191
0271	Back Hoe	2004	Caterpillar 420D IT	BLN07068
0142	Back Hoe	2002	Caterpillar 420D	FDP3930
0198	Back Hoe	2005	Caterpillar 420D 4X4	FDP025722
0113	Back Hoe	2001	Caterpillar 420D IT	BLNO 1605
0272	Back Hoe	2006	Caterpillar 420E	HLS01016
0175	Scraper	1996	Caterpillar 621E	4 5 K00499
0177	Scraper	1996	Caterpillar 621F	4S1-(0500
0083	Scraper	1999	Caterpillar 621F	8PL00178
0339	Scraper	2001	Caterpillar 621F	SPL00239
0340	Scraper	2001	Caterpillar 621F	SPL00240
0256	Compactor	2012	Caterpillar CS44	M4C00369
0160	Loader, Wheel	1998	Caterpillar 950G	4BS00404
003 9	Mixer	1990	Caterpillar SS-250	6DD00I 88
0259	Compactor	2012	Caterpillar CB54B	RJN00135
0244	Compactor	2005	Caterpillar CP323C	EAS00280
0070	Compactor	01992	Caterpillar CS 563	SXF0475
0121	Dump, Off-Road	2000	Caterpillar D250E, Articulating	4PS-00543
0037	Dozer	1997	Caterpillar D3C	SGS00234
0281	Dozer	2003	Caterpillar DSG LGP	FDW009 1 4
0116	Dozer	2001	Caterpillar DSC LGP	6CS01151
0204	Dozer	2004	Caterpillar D5G LGP	RKG00606
0081	Dozer	1988	Caterpillar D6D LGP	33X0548
0283	Dozer	2001	Caterpillar D6M	4JN00596
0133	Dozer	2001	Caterpillar D6M	4JNO1604
0173	Dozer	1996	Caterpillar D6R	9PN01050
0234	Dozer	2001	Caterpillar D6R LGP	9PN01734
0226	Dozer	2001	Caterpillar D6R LGP	9PN 10790
0174	Dozer	1996	Caterpillar D8R	7XM01127
0165	Fork Lift	1996	Caterpillar DP70	9CP00481
0127	Mixer	2000	Caterpillar RM250C	AWGOOI97
0315	Mixer	2014	Caterpillar RM300	BWR00664
0010	Motor Grader	1999	Champion 720 AVHP	29723
0267	Golf Cart	2010	Club Car XRT1550SE	162598
0243	Golf Cart	2009	Club Car	003155
0059	Road Widener	c2000	CMI MTP 4004	7193
0184	Road Widener	c2004	CMI MTP 4004	R6843
0164	Mixer	1999	CMI RS425	526229
0063	Paver	1994	CMI SF3002	5127
0322	Pump	Unk	Cornell 6"	8902
0320	Pump	Unk	Cornell 6"	6N1-TA-RPEM184
0194	Dozer	2005	Caterpillar D8T	J8B003 94
02 03	Prime Generator Set	Unk	Detroit 150KW	129908
0324	Pump	Unk	Deutz 4"	7186
0321	Pump	Unk	Deutz 6"	0858
0036	Trencher	01996	Ditch Witch S110	5N0249
0233	Trencher	2000	Ditch Witch 3700DD	3T1215
0284	Boring Machine	1998	Ditch Witch JT 4020	2R3060
0041	Trencher	1997	Ditch Witch 5110	SP00434
0285	Trencher	1995	Ditch Witch 410 SXDD	4M0495
0330	Message Board	Unk	DOT DH-1000	513904

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ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0171	Dozer	2006	Komatsu D37 PX-21	5538
0298	Rock Spreader	c1997	Etnyre	K5668
0101	Motor Grader	1 997	Flat Allis 65C	8555285
0017	Back Hoe	1 994	Ford 555D	A422408
0021	Crane	1990	Galion 150A	10222
0296	Crane	1990	Galion 150FA	9889
0295	Crane	1991	Galion 150FA	10108
0237	Lift, Personnel	2004	Genie Z-45/25	NZ452504-23817
0166	Paver	1998	Gomaco GT3 600	902900269
0024	Pump	Unk	Gomian Rupp 6	1076924
0003	Dewatering System	Unk	Griffin	06WPRD-950
0210	Dewatering System	Unk	Griffin	SWPRD92
0318	Vacuum Pump	Unk	Griffin Pump	6WPRD-1 189
0319	Vacuum Pump	Unk	Griffin Pump	6WPRD-0845
0316	Vacuum Pump	Unk	Griffin Pump	6WPRD-1 185
0317	Vacuum Pump	Unk	Griffin Pump	6WPRD-1911
0187	Crane	1990	Grove RT528C, 28 Ton	73562
0323	Pump	Unk	HM ISUZU 4"	2407
0312	Concrete Saw	Unk	Husqvarna FS660 D36	001257871001
0343	Concrete Saw	2015	Husqvama	001348191001
0290	Compactor	2005	Ingcrsoll Rand SD-45F	174815
0307	Air Compressor	1993	Ingersoll Rand 185	232105UDD328
0306	Air Compressor	2001	Ingersoll Rand 185	323 038UFL295
0311	Air Compressor	2002	Ingersoll Rand 185	327745UBM295
0305	Air Compressor	2003	Ingersoll Rand 185	337595UEN295
0309	Air Compressor	Unk	Ingersoll Rand 185	192907U91328
0338	Air Compressor	Unk	Ingersoll Rand 185	3 82023UARB34
0170	Air Compressor	Unk	Ingersoll Rand P185WJD	3 6442 5
0042	Air Compressor	1999	Ingersoll Rand P375	2967 8 8
0009	Air Compressor	1999	Ingersoll Rand 185	297085
0152	Air Compressor	2000	Ingersoll Rand 185	317286
0007	Back Hoe	1989	JCB 1400B	347203
0326	Pump	Unk	Jet Pump 300	6704
0262	Lift, Personnel	2007	JLG 600	0300114459
0190	Dozer	c2007	John Deere 850J	149892
0193	Dozer	c2007	John Deere 8501	T0850JX143150
0013	Excavator	1995	John Deere 190 E	10274
0325	Pump	Ukn	John Deere 4"	3655
0089	Tractor & Loader	2000	John Deere 5310 & 541	3255
0252	Crane	2014	Kobeleo CK 1 100G	GH04-03298
0018	Dozer	1993	Komatsu D37	3151
0052	Dozer	2000	Komatsu D37 P	3908
0168	Dozer	2004	Komatsu D37 PX-21	5101
0156	Dozer	2005	Komatsu D39 PX-21	1278
0129	Dozer	2001	Komatsu D39 P-1	P096331
0060	Dozer	1999	Komatsu D41 E-6	B21323
0005	Dozer	1 999	Komatsu D41 P-6	B21351
0153	Dozer	01998	Komatsu D41 P-6	1031
0151	Dozer	2003	Komatsu D41 P-6B	B30225
0027	Dozer	c1995	Komatsu D58 E~I	82339
0282	Dozer	2000	Komatsu D61 PX-12 W/GPS	1037
0131	Dozer	c2 004	Komatsu D61 PX-12	B3093
0179	Dozer	c2004	Komatsu D61 PX-12	B3029

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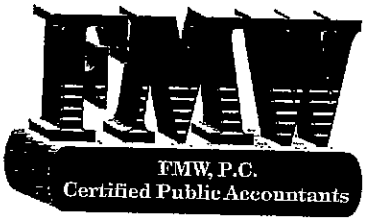
ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0056	Motor Grader	c1998	Komatsu GD 530A	210020
0182	Motor Grader	2006	Komatsu GD 655-3	51224
0126	Motor Grader	1 999	Komatsu GD 530A	203904
0294	Motor Grader	2005	Komatsu GD 655	51013
0137	Excavator	2000	Komatsu PC120-6	63900
0097	Excavator	2001	Komatsu PC128UU-1	T3424
0096	Excavator	01997	Komatsu PCI28UU-1	T3069
0276	Excavator	02004	Komatsu PC160-7	K40403
0213	Excavator	2007	Komatsu PC18MR-2	17680
0212	Excavator	2007	Komatsu PC18MR-2	17686
0214	Excavator	2007	Komatsu PC 1 8MR-2	17687
0223	Excavator	02008	Komatsu PC 1 8MR	20114
0124	Excavator	01998	Komatsu PC200-6	TA83322
0123	Excavator	01998	Komatsu PC200 LC-6	TA83631
0120	Excavator	2002	Komatsu PC220 LC-6LE	A85420
0020	Excavator	c1994	Komatsu PC220-LC5	A70845
0046	Excavator	01994	Komatsu PC220-LC6	A803 84
0057	Excavator	1998	Komatsu PC22O~LC6	A83379
0155	Excavator	2002	Komatsu PC220-LC6	A85394
0161	Excavator	2002	Komatsu PC220-LC6	A85423
0139	Excavator	2002	Komatsu PC220 LC-6	A83539
0100	Excavator	2001	Komatsu PC220 LC-6LE	A85256
0189	Excavator	2007	Komatsu PC220 LC~8	A88329
0197	Excavator	2006	Komatsu PC220 LC-8	A88157
0258	Excavator	2014	Komatsu PC240 LC-10	90190
0167	Excavator	2005	Komatsu PC27 MR-2	15952
0136	Excavator	1998	Komatsu PC25O LC-6	AS3082
0022	Excavator	1995	Komatsu PC300 LC-5	A30199
0023	Excavator	1995	Komatsu PC300 LC-5	A3020O
0183	Excavator	2007	Komatsu PC300 LC-7	A87040
0188	Excavator	2006	Komatsu PC300 LC-7E	A88058
0004	Excavator	1996	Komatsu PC4O	25483
0019	Excavator	1993	Komatsu PC400 LC-5	A70867
0114	Excavator	c1997	Komatsu PC400 LC~6	A80430
0192	Excavator	c2007	Komatsu PC400 LC-7E	A87519
0227	Excavator	c2005	Komatsu PC400 LC-7E0	50267
0030	Excavator	2005	Komatsu PC40-7	25473
0048	Excavator	2000	Komatsu PC45-8	5967
0068	Excavator	2000	Komatsu PC45-8	5973
0141	Excavator	2002	Komatsu PC45MR-1	3 092
0261	Excavator	2012	Komatsu PC490 LC-10	A40077
0215	Excavator	2007	Komatsu PC50 MR-2	8205A
0224	Excavator	2010	Komatsu PC50 MR	8309
0110	Excavator	1996	Komatsu PC60	50846
0112	Excavator	1996	Komatsu PC60-7	50697
0143	Excavator	C1996	Komatsu PC60-7	T50847
0047	Excavator	c1999	Komatsu PC60-7	56155
0200	Excavator	2007	Komatsu PC78-MR6	1353
0274	Excavator	2007	Komatsu PC78-MR6	2082
0275	Excavator	c2010	Komatsu PC88MR-8	5409
0248	Excavator	c2012	Komatsu PC88MR~8	5733
0249	Excavator	c2012	Komatsu PC88MR-8	602 6
0257	Excavator	c2015	Takeuchi TB290	185100850

ALLCO

ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0044	Wheel Loader	2000	Komatsu WA 1 20	A30079A
0034	Wheel Loader	1 994	Komatsu WA] 80	A75423
0092	Wheel Loader	1996	Komatsu WAI80	TA76279
0028	Wheel Loader	1996	Komatsu WA180	A75746
0135	Wheel Loader	1997	Komatsu WAI80-1	TA76455
0280	Wheel Loader	2005	Komatsu WA200-5	65964
0195	Wheel Loader	2007	Komatsu WA200-5	68903
0098	Wheel Loader	2003	Komatsu WA250-3	A71848
0273	Back Hoe	2007	Komatsu WB140—2	A22631
0216	Excavator	02009	Komatsu Mini PCSSMR-8	5043
0242	Utility Vehicle	Unk	Kubota RTV900	97094
0245	Mower	2011	Kubota ZD331	32438
0308	Air Compressor	1994	Leroi I85cfm	N3272X3 79
0304	Welding Machine	1998	Lincoln 400	U1980806096
0337	Welding Machine	2007	Lincoln 300D	C1070100030
0208	Fork Lift	1997	Lull 81(42	7Y19P22-276
0225	Tractor	2001	Massey Ferguson 27IX	9916BK2303 1
0106	Sweeper	1997	Caterpillar 6600	965465
0253	Gas Fusion Machine	02014	McE1r0y C-618	C64722
0221	Frack Tank	2008	Frack 500 Barrel 500	4S9SV46117T084698
0219	Frack Tank	2008	Frack 500 Barrel 500	4S9SV46146T084256
0220	Frack Tank	2008	Frack 500 Barrel 500	4S9SV461X7T084862
0218	Frack Tank	2008	Frack 500 Barrel 500	50005080801016500
0329	Power Pack	Unk	?pe Bursting System	T0404577313
0328	Power Pack	Unk	Epe Bursting System	T04045796693
0327	Power Pack	Unk	Pipe Bursting System	T04045TF150
0301	Power Pack	Ukn	Pipe Bursting Trailer	PE40451078639
0300	Power Pack	Unk	Pipe Bursting Trailer	PE4045L072487
0302	Power Pack	Unk	Pipe Bursting Trailer	PE4045L078640
0150	Attenuator	2005	Attenuator Scorpion	1238
0202	Data System		Data System Westem	105810285B
0191	Data System		Data System Westem	T1826
0251	Frack Tank	Unk	Frack Tank (assume 500bbl)	31411
0333	Pump	Unk	Pioneer 12" Vac Asst	1064
0334	Pump	Unk	Pioneer 12" Vac Asst	1325
0335	Pump	Unk	Pioneer 12" Vac Asst	1788
0230	Tiller	2009	Quick AttachTiller	1020550
0206	Copier	Unk	Ricoh C5000SPF	NA
0238	Frack Tank	Unk	Frack 250 Barrel Rig Planet	250BBL
0297	Paver	2007	ROADTEC RP195	RP195X143
0099	Total Station	Unk	Trimble ATS600	64620529
0001	Compactor	2000	Rosco TRUPAC 915	38333
0015	Vacuum Trailer	1 993	Sanitary Sewer Vacuum	92/93-1116
0016	Vacuum Trailer	1 993	Sanitary Sewer Vacuum	92/93-1117
0090	Message Board	2001	Solar Tech	408759
0091	Message Board	2001	Solar Tech	408761
0149	Laser Total Station	Unk	Spectra	1648
0146	Laser Total Station	2004	Spectra	64620742
0231	Landscape Rake	2009	Stone Dawg	1020551
0310	Air Compressor	Unk	Sullair 185	004-125271
0107	Crane, Crawler	c1980	Link Belt LS188	2201
0109	Excavator	1995	Takeuchi TB015	1154503
0108	Excavator	1995	Takeuchi TB015	1154504

ALLCO

ID#	ITEM	YEAR	DESCRIPTION	SN/VIN
0287	Loader, Skid Steer	2014	Takcuchi TL10	201001303
0103	Loader, Skid Steer	1998	Takeuchi TLI26	21260073
0270	Loader, Skid Steer	c2015	Takeuchi TL] 2	201201998
0247	Loader, Skid Steer	2013	Takeuchi TL10	201000478
0105	Loader, Skid Steer	1995	Takeuchi TL26	2620263
0260	Loader, Skid Steer	2014	Takeuchi TL8	200800512
0115	Concrete Saw	Unk	Target Pro65 III 65 HP	378698
0299	Placer	2006	Terex PS-3502	527073
51	Lift, Personnel	2000	Terex TB 42	99690025
0303	Water Wagon	1996	Terex 3066C, 5,000 gal	A7I01030
0235	Concrete Buggy	Unk	Terex/Amida	0004-64465
0236	Broom	Z003	Terramite TSS38	23TS0I08
0006	Terra-Ram	1995	Pipe Bursting System	12100262
0163	Trailer	Unk	Trail king 53'	1T10053365M040891
0241	Dual GPS System	Unk	Trimble GCS9000	14811518SP
0240	Dual GPS System	Unk	Trimble GCS9000	74805-II
0239	Dual GPS System	Unk	Trimble GCS9000	90460-50
0058	Compactor	1 999	Vibromax 1103 PD	JKC8303908
0031	Compactor	1997	Vibromax 602B	JKC8409703
0291	Compactor	1 994	Wacker RD880V	673603211
0025	Broom	Unk	Waldron	22648
0211	Hydraulic Drill	2009	Well Point Deep Rock DR20	7881
0232	Frack Tank	Unk	Wichita 500 BBL	WTM~02395
0014	Sewer Cleaner	1992	Master Builder oflowa 800	354CID
0292	Compactor	c1997	Wacker RT560	5569443
0279	Excavator	02015	Takeuchi TB290	185100931
0064	Texture Curing Machine	Unk	CMI TC3004	8212
0043	Butt Fusin Machine	1999	Christy	J14I0
0264	Message Board	2005		4GM2M151351409089
0263	Message Board	2005		4GM2M151X51409090
0278	Cutter Attachment	Unk	Brush Cat	2620263
0266	FRAC Tank- yellow	Unk	500bbl	0721913
0065	Profilograph with Trailer Vin	2001	111088-016	161-1CBI0181H085170
0254	Steel Hull Work Platfonn w/trailer	UKN	40'x9'	ALZ257258013
NA	Chip Spreader	c2015	Etnyre	K7049



DAVID E. WHITE, CPA
TERRY S. WHIDDON, CPA
RYAN C. HARKEY, CPA

H. B. FUNCHESS III, CPA
(1932-1995)
LARRY L. MILLS, CPA
(Retired)

INDEPENDENT AUDITORS' REPORT

To the Members
Allco, LLC
Beaumont, Texas

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of Allco, LLC and its subsidiary which comprise the consolidated balance sheet as of December 31, 2016, and the related consolidated statements of income and comprehensive income, equity, and cash flows for the year then ended, and the related notes to the financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

1150 NORTH ELEVENTH ST. • BEAUMONT, TX 77702-1207
409-838-3755 • 1-888-FMW-CPAS (369-2727) • FAX 409-838-1491 • www.fmwcpas.com

Opinion

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of Allco, LLC and its subsidiary, as of December 31, 2016, and the results of their operations and their cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

FMW, P.C.

Beaumont, Texas
April 20, 2017

ALLCO, LLC AND SUBSIDIARY

CONSOLIDATED BALANCE SHEET
December 31, 2016

Assets

Current Assets		
Cash		$ 10,504,903
Marketable securities		688,284
Accounts receivable (including Retainage $3,489,041)		16,969,841
Deposits		71,869
Cash value of life insurance		229,857
Cost and estimated earnings in excess of billings		311,822
Other current assets		23,000
Total Current Assets		28,799,576
Fixed Assets		
Land	$ 250,000	
Machinery and equipment	18,947,080	
Vehicles	5,457,490	
Furniture and fixtures	1,310	
Capitalized permitting cost	310,709	
Sewer lines	8,396,825	
Waste water treatment plant	662,759	
Total Fixed Assets	34,026,173	
Less: Accumulated depreciation	(21,422,054)	
Total Fixed Assets Net		12,604,119
Total Assets		$ 41,403,695

The accompanying notes are an integral part of these consolidated financial statements.

ALLCO, LLC AND SUBSIDIARY

CONSOLIDATED BALANCE SHEET
December 31, 2016

Liabilities and Members' Equity

Current Liabilities		
Accounts payable and accrued expenses (including retainage of $2,622,959)		$ 8,495,026
Billings in excess of cost and estimated earnings		4,872,568
Notes payable		1,453,127
Other current liabilities		114,221
Total Current Liabilities		14,934,942
Long-Term Liabilities		
Long-term debt	$ 3,404,476	
Other long-term liabilities	528,303	3,932,779
Total Liabilities		18,867,721
Equity		
Members' Equity	$ 20,635,974	
Preferred Member's Equity	1,900,000	
Total Equity		22,535,974
Total Liabilities and Members' Equity		$ 41,403,695

The accompanying notes are an integral part of these consolidated financial statements.

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? YES

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner, in verification of the recitals comprising this statement of Bidder's Qualifications.

The Bidder shall provide a brief description of any litigation or administrative proceeding of the following types, either pending or concluded within the proceeding year, to which the Bidder (and the ultimate controlling person, if different from the Bidder) or any of its directors or executive officers was a party or of which the property of any such person is or was the subject; the names of the parties and the court or agency in which such litigation or proceeding is or was pending shall be given:

(a) Administrative or judicial proceedings of any state federal agency or authority concerning environmental violations; NONE

(b) Proceedings which may have a material effect upon the solvency of the ultimate holding company, including but not necessarily limited to, bankruptcy and receivership; and NONE

(c) Criminal proceedings. NONE

Dated at BEAUMONT this 8TH day of AUGUST, 2017.

ALLCO

(Name of Bidder)

By

T.W. HARRISON

Title PRESIDENT

STATE OF TEXAS)

) §.

COUNTY OF JEFFERSON)

T.W. HARRISON being duly sworn deposes and says that he is

PRESIDENT of ALLCO
(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

SUBSCRIBED AND SWORN TO BEFORE ME this 8TH day of AUGUST, 2017.

(Notary Public)

My Commission Expires:

MAY 21, 2020

JACQUELINE CHRISTOPHER
Notary Public, State Of Texas
Comm. Expires 05-21-2020
My Notary ID # 155932-5

Bidder Shall Return Completed Statement with Offer.

CONFLICT OF INTEREST QUESTIONNAIRE

CONFLICT OF INTEREST QUESTIONNAIRE — FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY
Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

ALLCO

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information in this section is being disclosed.**

JEFFERSON COUNTY

Name of Officer

This section (item 3 including subparts A, B, C, & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☒ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☒ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more?

☐ Yes ☒ No

D. Describe each employment or business and family relationship with the local government officer named in this section.

N/A

4

Signature of vendor doing business with the governmental entity

8-8-17

Date

T.W. HARRISON - PRESIDENT

ALLCO L.L.C. TEXAS

Bidder Shall Return Completed Form with Offer.

LOCAL GOVERNMENT OFFICER
CONFLICTS DISCLOSURE STATEMENT – (OFFICE USE ONLY)

LOCAL GOVERNMENT OFFICER CONFLICTS DISCLOSURE STATEMENT

FORM CIS

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This is the notice to the appropriate local governmental entity that the following local government officer has become aware of facts that require the officer to file this statement in accordance with Chapter 176, Local Government Code.

OFFICE USE ONLY

Date Received

1 **Name of Local Government Officer**

2 **Office Held**

3 **Name of vendor described by Sections 176.001(7) and 176.003(a), Local Government Code**

4 **Description of the nature and extent of employment or other business relationship with vendor named in item 3**

5 **List gifts accepted by the local government officer and any family member, if aggregate value of the gifts accepted from vendor named in item 3 exceeds $100 during the 12-month period described by Section 176.003(a)(2)(B).**

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

(attach additional forms as necessary)

6 **AFFIDAVIT**

I swear under penalty of perjury that the above statement is true and correct. I acknowledge that the disclosure applies to each family member (as defined by Section 176.001(2), Local Government Code) of this local government officer. I also acknowledge that this statement covers the 12-month period described by Section 176.003(a)(2)(B), Local Government Code.

_____
Signature of Local Government Officer

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20 _____, to certify which, witness my hand and seal of office.

_____
Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath

Adopted 8/7/2015

Vendor References

Please list at least three (3) companies or governmental agencies (preferably a municipality) where the same or similar products and/or services as contained in this specification package were recently provided.

THIS FORM MUST BE RETURNED WITH YOUR BID.

REFERENCE ONE

Government/Company Name: PLEASE SEE ATTACHED.

Address: _____

Contact Person and Title: _____

Phone: _____ Fax: _____

Email Address: _____ Contract Period: _____

Scope of Work: _____

REFERENCE TWO

Government/Company Name: _____

Address: _____

Contact Person and Title: _____

Phone: _____ Fax: _____

Email Address: _____ Contract Period: _____

Scope of Work: _____

REFERENCE THREE

Government/Company Name: _____

Address: _____

Contact Person and Title: _____

Phone: _____ Fax: _____

Email Address: _____ Contract Period: _____

Scope of Work: _____

Bidder Shall Return Completed Form with Offer.

ALLCO
LIST OF PROJECTS NOW ENGAGED IN COMPLETING

Contract Amount	Class of Work	Percent Completed	Where Located City/County/State	Owner or Owner Representative
15,990,000	New High School Buna Independent School District	97%	Buna Jasper Texas	Architectural Alliance 350 Pine Street Ste. 720 Beaumont Texas 77701 409-866-7196
5,600,000	Crenshaw Water Plant Ground Storage Tank	99%	Pasadena Harris Texas	City of Pasadena 1114 Davis Street Ste. 300 Pasadena Texas 77506 713-475-4995
12,605,000	Surface Water Treatment Plant Improvements Phase I	93%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
7,950,000	Water Treatment Plant Lake Livingston Water & Sewer Service Corp	99%	Livingston Polk Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
50,000,000	Alligator Bayou Pump Station Annex-Drainage District No. 7	60%	Port Arthur Jefferson Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
300,000	Site Grading Port Arthur Business Park	99%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
191,000,000	Textile Manufacture Facility	0%	Port Arthur Jefferson Texas	Pure Renewable Systems 6712 E. 118 Street Bixby Oklahoma 74008 918-406-2557
2,690,000	Port Acres Wastewater Treatment Plant Improvements	95%	Port Acres Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888

ALLCO
LIST OF PROJECTS NOW ENGAGED IN COMPLETING

Contract Amount	Class of Work	Percent Completed	Where Located City/County/State	Owner or Owner Representative
2,200,000	City of Anahuac Wastewater Treatment Plant Rehab ContractA	70%	Anahuac Chambers Texas	Carroll & Blackman 3120 Fannin Street Beaumont Texas 77702 409-833-3363
1,300,000	City of Rose City Bridges Project #2	95%	Rose City Orange Texas	Goodwin Lasiter 1609 S. Chestnut Ste. 202 Lufkin Texas 75901 936-637-6336
740,000	Asphalt Road Repairs Rosen & Various Streets City of Bridge City	90%	Bridge City Orange Texas	Action Engineers 8460 Central Mall Dr. Ste. J Port Arthur Texas 77642 409-983-6263
23,750,000	Surface Water Treatment Plant Improvements Phase 2	60%	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. Ste. 320 Port Arthur Texas 77642 409-724-7888
3,260,000	Jack Brooks Regional Airport Runway Reconstruction	99%	Beaumont Jefferson Texas	Garver USA C/O 1149 Pearl Street Beaumont Texas 77701 713-491-8333
2,861,000	Wastewater Treatment Plant Expansion Phase 2A & 2B	20%	Orange Orange Texas	Schaumburg & Polk 8865 College Street Beaumont Texas 77707 409-866-0341

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
2,690,000	Port Acres Wastewater Treatment Plant Improvements	2016	Port Acres Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
3,260,000	Jack Brooks Regional Airport Runway Reconstruction	2016	Beaumont Jefferson Texas	Garver USA C/O 1149 Pearl Street Beaumont Texas 77701 713-491-8333
300,000	Site Grading Port Arthur Business Park	2016	Port Arthur Jefferson Texas	Arceneaux Wilson & Cole 2901 Turtle Creek Dr. #320 Port Arthur Texas 77642 409-724-7888
740,000	Asphalt Road Repairs Rosen & Various Streets City of Bridge City	2016	Bridge City Orange Texas	Action Engineers 8460 Central Mall Dr. Ste. J Port Arthur Texas 77642 409-983-6263
1,300,000	City of Rose City Bridges Project #2	2016	Rose City Orange Texas	Goodwin Lasiter 1609 S. Chestnut Ste. 202 Lufkin Texas 75901 936-637-6336
5,600,000	Crenshaw Water Plant Ground Storage Tank	2016	Pasadena Harris Texas	City of Pasadena 1114 Davis Street Ste. 300 Pasadena Texas 77506 713-475-4995
7,950,000	Water Treatment Plant Lake Livingston Water & Sewer Service Corp	2016	Livingston Polk Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
12,900,000	South Park Drainage Relief Project	2015	Beaumont Jefferson Texas	City of Beaumont 801 Main Street Beaumont Texas 77701 409-880-3725
1,407,000	Water & Sewer Rehab South Park Area	2015	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-735-3000

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
1,612,000	Coopers Gully Pump Station - City of Orange	2015	Orange Orange Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
3,400,000	Water System Improv. Keith Lake to Sabine Pass Standpipe	2015	Port Arthur Jefferson Texas	Arceneaux & Gates 2901 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
1,130,000	Wastewater Treatment Plant Improvements Phase IA & IB	2015	Orange Orange Texas	Schaumburg & Polk 8865 College Street Beaumont Texas 77707 409-866-0341
3,200,000	24" Waterline City of Port Arthur-19th St. to Sabine Neches Canal	2015	Port Arthur Jefferson Texas	Arceneaux & Gates 2901 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
3,492,000	Sanitary Sewer Impr 54" Interceptor	2015	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
1,750,000	Wastewater Collection Rehabilitation	2015	Nederland Jefferson Texas	Schaumburg & Polk Inc. 8865 College Street Beaumont Texas 77707 409-866-0341
3,350,000	Detention Ponds & Drainage Facilities Imperial Phase II	2015	Sugarland Fort Bend Texas	LJA Engineers 2929 Briarpark Houston Texas 77042 713-953-520
3,350,000	Detention Ponds & Drainage Facilities Imperial Phase II	2015	Sugarland Fort Bend Texas	LJA Engineers 2929 Briarpark Houston Texas 77042 713-953-520
4,500,000	Orange County WCID #1 Cloverleaf Tiger Lake Lift Station/Force Main	2014	Vidor Orange Texas	Carroll & Blackman 3120 Fannin Beaumont Texas 77702 409-833-3363

ALLCO
LIST OF COMPLETED CIVIL/HEAVY PROJECTS

Contract Amount	Class of Work	When Completed	Where Located City/County/State	Owner or Owner Representative
1,800,000	City of Missouri City Prestressed Concrete Clearwell	2014	Missouri City Fort Bend Texas	Enprotec/Hibbs & Todd 402 Cedar Street Abilene Texas 79601 325-698-5560
2,500,000	Asphalt Road Repair City Wide -Bridge City	2014	Bridge City Orange Texas	d.p. Consulting Engineers 3727 Doctors Drive Port Arthur Texas 77642 409-983-6263
430,000	Clarifier Rehabilitation	2014	Orange Orange Texas	Firestone Polymers 5713 FM 1006 Orange Texas 77630 409-924-4626
457,000	Post Office Lift Station Improvements	2014	Port Neches Jefferson Texas	Carroll & Blackman Inc. 3120 Fannin Beaumont Texas 77702 409-833-3363
2,400,000	Fort Polk Sewer American Water	2014	Fort Polk Vernon Louisiana	Arceneaux & Gates 3501 Turtle Creek Drive Port Arthur Texas 77642 409-724-7888
10,000,000	Richland Chambers Wetland Expansion Improvements	2013	Fairfield Navarro Texas	Alan Plummer Associates 1349 Empire Central Ste 1000 Dallas Texas 75247 214-631-6100
2,000,000	Water System Improvements	2013	Nederland Jefferson Texas	City of Nederland 1400 Boston Avenue Nederland Texas 77627 409-723-1542
2,700,000	Sanitary Sewer 60" Trunk Outfall	2013	Beaumont Jefferson Texas	City of Beaumont 1350 Langham Beaumont Texas 77707 409-785-3000
1,150,000	Asphalt Road Repair Repair City of Bridge City	2013	Bridge City Orange Texas	d.p. Consulting Engineers 3727 Doctors Dr. Port Arthur Texas 77642 409-983-6263

ALLCO REFERENCES

CARROLL & BLACKMAN
MR. ALAN SIMMS, P.E.
3120 FANNIN
BEAUMONT TEXAS 77702
409-833-3363
asims@cbieng.com

ARCENEAUX, WILSON & COLE ENGINEERS
MR. JOE WILSON, P.E.
2901 TURTLE CREEK DR. SUITE 320
PORT ARTHUR TEXAS 77642
409-724-7888
jwilson@ageng.com

d.p. CONSULTING ENGINEERS
MR. MARK KELLY
3727 DOCTORS DRIVE
PORT ARTHUR TEXAS 77642
409-986-6263
mkelly@dpengineersinc.com

BOB SHAW CONSULTING ENGINEERS
MR. ED LONG, P.E.
4749 TWIN CITY HIGHWAY
PORT ARTHUR TEXAS 77642
409-962-0263
elong@bobshawce.com

SCHAUMBURG & POLK ENGINEERS
MR. RICKY J. BOURQUE, P.E.
8865 COLLEGE STREET
BEAUMONT TEXAS 77707
409-866-0341
rbourque@spi-eng.com

PAGE 2
REFERENCES
ALLCO

CITY OF ORANGE
MR. JAMES B. WOLF, P.E.
803 W. GREEN
ORANGE TEXAS 77630
409-883-1900
jwolf@orangetx.org

ORANGE COUNTY W.C.I.D. NO. 1
MR. NORMAN BLACKMAN, P.E.
460 E. BOLIVAR STREET
VIDOR TEXAS 77662
409-769-2669
nblackman@ocwc1.com

CITY OF NEDERLAND
MR. STEVE HAMILTON, P.E.
207 NORTH 12TH
NEDERLAND TEXAS 77627
409-723-1542
Shamilton@ci.nederland.tx.us

CITY OF PORT ARTHUR
DR. JIMMY JOHNSON
444 4TH STREET
PORT ARTHUR TEXAS 77640
409-983-8226
john.tomplait@portarthur.net

SECTION E
DBE PARTICIPATION AND RESIDENCE CERTIFICATION REPORTING

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: ALLCO DBE: ☐ Yes ☒ No

Address: 6720 COLLEGE (Street) BEAUMONT (City) TEXAS (State) 77707 (Zip)

Phone (with area code): 409-860-4459 Fax (with area code): 409-860-3857

Project Title & No.: Jack Brooks Regional Airport Taxiway D Reconstruction (2017) Project #17-024/JW

Prime Contract Amount: $ Not known at Bid Time

DBE Subcontractor Name: NOT KNOWN AT BID TIME. WILL SUBMIT AFTER CONTRACT AWARD.

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____ (Street) _____ (City) _____ (State) _____ (Zip)

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

T.W. HARRISON - PRESIDENT		AUGUST 8, 2017
Printed Name of Contractor Representative	Signature of Representative	Date
Printed Name of DBE	Signature of Representative	Date

ALLCO, L.L.C. TEXAS

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Prime Contractor: ALLCO DBE: ☐ Yes ☒ No

DBE Status (Gender & Ethnicity): _____

Address: 6720 COLLEGE (Street) BEAUMONT (City) TEXAS (State) 77707 (Zip)

Phone (with area code): 409-860-4459 Fax (with area code): 409-860-3857

Project Title & No.: Jack Brooks Regional Airport Taxiway D Reconstruction (2017) Project #17-024/JW IFB/RFP No.: _____

Total Contract: $ Not known at Bid Time Total DBE Subcontract(s): $ Not known at Bid Time

Construction DBE Goals: 12.90% DBE:: Not known at bid time. %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: NOT KNOWN AT BID TIME.

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____ (Street) _____ (City) _____ (State) _____ (Zip)

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: N/A

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: N/A

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☒ Other: DBE PARTICIPATION NOT KNOWN AT BID TIME.

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☒ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: INFORMATION NOT KNOWN AT BID TIME.

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required**. I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): T.W. HARRISON

Title: PRESIDENT

Signature: _____

Date: AUGUST 8, 2017

E-mail address: tharrison@allco.com

ALLCO, L.L.C. TEXAS

Contact person that will be in charge of invoicing for this project:

Name (print or type): BRANDON HARRISON

Title: PROJECT MANAGER

Date: AUGUST 8, 2017

E-mail address: bharrison@allco.com

Bidder Shall Return Completed Form with Offer.

GOOD FAITH EFFORT (GFE) DETERMINATION CHECKLIST

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions: In order to determine if a "Good Faith Effort" was made in soliciting DBEs for subcontracting opportunities, the following checklist and supporting documentation shall be completed by the Prime Contractor/Consultant, and returned with the Prime Contractor/ Consultant's bid. This list contains the **minimum** efforts that should be put forth by the Prime Contractor/Consultant when attempting to achieve or exceed the goals of DBE Subcontractor participation. The Prime Contractor/Consultant may extend his/her efforts in soliciting DBE Subcontractor participation beyond what is listed below.

Did the Prime Contractor . . .

☒ Yes	☐ No	1. To the extent practical, and consistent with standard and prudent industry standards, divide the contract work into the smallest feasible portions, to allow for maximum DBE Subcontractor participation?
☒ Yes	☐ No	2. **Notify** in writing a reasonable number of DBEs, allowing sufficient time for effective participation of the planned work to be subcontracted?
☒ Yes	☐ No	3. **Provide** DBEs that were genuinely interested in bidding on a subcontractor, adequate information regarding the project (i.e., plans, specifications, scope of work, bonding and insurance requirements, and a point of contract within the Prime Contractor/Consultant's organization)?
☒ Yes	☐ No	4. **Negotiate** in good faith with interested DBEs, and not reject bids from DBEs that qualify as lowest and responsive bidders?
☐ Yes	☒ No	5. **Document** reasons DBEs were rejected? Was a written rejection notice, including the reason for rejection, provided to the rejected DBEs? DBE'S WERE NOT KNOWN AT TIME OF BID.
☒ Yes	☐ No	6. If Prime Contractor/Consultant has zero (0) DBE participation, **please explain the reasons why.** DBE'S PARTICIPATION NOT KNOWN AT BID TIME.

If "No" was selected, please explain and include any pertinent documentation with your bid.
If necessary, please use a separate sheet to answer the above questions.

T.W. HARRISON
Printed Name of Authorized Representative

Signature

PRESIDENT
Title

AUGUST 8, 2017
Date

ALLCO, L.L.C. EXTRA

Bidder Shall Return Completed Form with Offer.

RESIDENCE CERTIFICATION/TAX FORM

Pursuant to Texas Government Code §2252.001 *et seq.*, as amended, Jefferson County requests Resident Certification. §2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of §2252.001 are stated below:

(3) "Nonresident bidder" refers to a person who is not a resident.

(4) "Resident bidder" refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

☒ I certify that ALLCO [company name] is a Resident Bidder of Texas as defined in Government Code §2252.001.

☐ I certify that _____ [company name] is a Nonresident Bidder as defined in Government Code §2252.001 and our principal place of business is _____ _____ (city and state).

Taxpayer Identification Number (T.I.N.):	76-0685119
Company Name submitting bid/proposal:	ALLCO
Mailing address:	PO BOX 3684, BEAUMONT, TEXAS 77704
If you are an individual, list the names and addresses of any partnership of which you are a general partner: N/A	

Property: List all taxable property owned by you or above partnerships in Jefferson County.

Jefferson County Tax Acct. No.*	Property address or location**
N/A	N/A

* This is the property amount identification number assigned by the Jefferson County Appraisal District.

** For real property, specify the property address or legal description. For business property, specify the address where the property is located. For example, office equipment will normally be at your office, but inventory may be stored as a warehouse or other location.

Bidder Shall Return Completed Form with Offer.

SECTION F
BID SURETY

BID BOND

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
Hartford, Connecticut 06183

KNOW ALL MEN BY THESE PRESENTS,

That we, **Allco** as Principal, hereinafter called the Principal, and TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, of Hartford, Connecticut, a corporation duly organized under the laws of the State of Connecticut, as Surety, hereinafter called the Surety, are held and firmly bound unto

Jefferson County

as Obligee, hereinafter called the Obligee, in the sum of ****5% GAB**** Dollars **(**Five Percent of Greatest Amount Bid**),** for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Bid No. IFB 17-024/JW

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this **8th** day of **August, 2017.**

Jackie Christopher (Witness)

Allco

(Principal) (Seal)

T.W. Harrison, President (Title)

Nicole LeBlanc
Nicole LeBlanc (Witness)

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

By K. Scott Miller
K. Scott Miller (Attorney-in-Fact)

Printed in cooperation with the American Institute of Architects (AIA) by Travelers Casualty and Surety Company of America. The language in this document conforms exactly to the language used in AIA Document A310, February 1970 edition.

S-1869-G (07-97)

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 226569 **Certificate No.** 007210292

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Larry W. Smith, George M. Haynes, and K. Scott Miller

of the City of Beaumont, State of Texas, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 28th day of April, 2017.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the 28th day of April, 2017, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
Commission expires the 30th day of June, 2021.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault
Marie C. Tetreault, Notary Public

58440-5-16 Printed in U.S.A.

SECTION G
CONTRACT

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

W I T N E S S E T H:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Two-Hundred and Seventy Four (274)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST:_____ By_____

_____Title:_____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST:_____ By _____

_____Title:_____
(Print the names underneath all signatures)

SECTION H
NOTICE OF AWARD AND NOTICE TO PROCEED

NOTICE OF AWARD

DATED:_____ , 2017

TO:

ADDRESS:

PROJECT OWNER: JEFFERSON COUNTY

FAA AIP GRANT No. 3-48-0018-034-2017

CONTRACT FOR: TAXIWAY D RECONSTRUCTION (2017) TAXIWAY F TO JERRY WARE APRON

CONSTRUCTION OF: JACK BROOKS REGIONAL AIRPORT

****

You are notified that your Bid dated XXX, 2017 for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for Base Bid with Additive Alternate No. X .

The Contract Price of your contract is_____ dollars and no /100 ($XXXXXX).

You must comply with the following conditions precedent within FIFTEEN (15) days of the date of this *Notice of Award* that is by, XXXXX, 2017

1. You must deliver to the **OWNER 4** fully executed counterparts of the Agreement including all the Contract Documents.

2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Advertisement for Bids, General Conditions (Article 2), and Supplementary Conditions.

3. You must deliver to the **OWNER 4** original ***Certificates of Insurance,*** naming the Owner ***(Jefferson County)*** and Engineer ***(Garver, LLC.)*** and their respective agents and employees, to be expressly named as additional insured's, in accordance with the General Conditions.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid in default, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within ten (10) days after you comply with the above conditions, OWNER will return to you one (1) fully signed counterpart of the Agreement with the Contract Documents attached.

Sincerely,

GARVER, LLC

Thomas D Dodson, PE

Senior Project Manager

ACCEPTANCE OF AWARD:

CONTRACTOR:

_____

BY:_____

TITLE:_____

DATE:_____

XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 274 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXXX, 2017.

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Thomas D Dodson, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

SECTION I
PERFORMANCE AND PAYMENT BONDS
CERTIFICATE OF INSURANCE

PAYMENT BOND

PERFORMANCE BOND

INSERT INSURANCE DOCUMENTS HERE

SECTION J
GENERAL PROVISIONS
(FAA AC 150/5370-10G)

GENERAL PROVISIONS

SECTION 10
DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-1 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-2 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-3 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-4 AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-5 AIR OPERATIONS AREA (AOA). For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-6 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

10-7 ASTM INTERNATIONAL (ASTM). Formerly known as the American Society for Testing and Materials (ASTM).

10-8 AWARD. The Owner's notice to the successful bidder of the acceptance of the submitted bid.

10-9 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 CALENDAR DAY. Every day shown on the calendar.

10-12 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.

10-13 CONTRACT. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

10-14 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-15 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 CONTRACTOR'S LABORATORY. The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

10-18 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-19 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-20 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.

10-21 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-22 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-23 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

10-24 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-25 FORCE ACCOUNT. Force account work is planning, engineering, or construction work done by the Sponsor's employees.

10-26 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections, observations and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-27 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or

cited standard that may be pertinent to such specific reference.

10-28 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as "Engineer's Laboratory" or "quality assurance laboratory."

10-29 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-30 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-31 MATERIALS. Any substance specified for use in the construction of the contract work.

10-32 NOTICE TO PROCEED (NTP). A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-33 OWNER. The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only.

10-34 PASSENGER FACILITY CHARGE (PFC). Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls."

10-35 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 PAYMENT BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-37 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-38 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-39 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-40 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-41 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

10-42 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-43 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-44 SPONSOR. A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-45 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-46 SUBGRADE. The soil that forms the pavement foundation.

10-47 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-49 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-50 TAXIWAY. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

10-51 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-52 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10

SECTION 20
PROPOSAL REQUIREMENTS AND CONDITIONS

20-1 ADVERTISEMENT (NOTICE TO BIDDERS). *(See Page A-2)*

20-2 QUALIFICATION OF BIDDERS. Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year.

Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.
Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

20-3 CONTENTS OF PROPOSAL FORMS. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-4 ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-5 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the

quantities may be increased or decreased as hereinafter provided in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

20-6 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications. **Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.**

20-7 PREPARATION OF PROPOSAL. The bidder shall submit his or her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. If so requested, the bidder shall state the price (written in ink or typed) both in words and numerals for which they propose to do for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign the proposal correctly and in ink. If the proposal is made by an individual, his or her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his or her authority to do so and that the signature is binding upon the firm or corporation.

20-8 RESPONSIVE AND RESPONSIBLE BIDDER. A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-9 IRREGULAR PROPOSALS. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 BID GUARANTEE. Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

20-11 DELIVERY OF PROPOSAL. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 WITHDRAWAL OR REVISION OF PROPOSALS. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by fax or email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 PUBLIC OPENING OF PROPOSALS. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 DISQUALIFICATION OF BIDDERS. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20

SECTION 30
AWARD AND EXECUTION OF CONTRACT

30-1 CONSIDERATION OF PROPOSALS. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-2 AWARD OF CONTRACT. The award of a contract, if it is to be awarded, shall be made within *the amount specified in the advertisement and proposal in* calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

30-3 CANCELLATION OF AWARD. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

30-4 RETURN OF PROPOSAL GUARANTY. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

30-5 REQUIREMENTS OF CONTRACT BONDS. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-6 EXECUTION OF CONTRACT. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section, within calendar days from the date mailed or otherwise delivered to the successful bidder.

30-7 APPROVAL OF CONTRACT. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-8 FAILURE TO EXECUTE CONTRACT. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

END OF SECTION 30

SECTION 40
SCOPE OF WORK

40-1 INTENT OF CONTRACT. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-2 ALTERATION OF WORK AND QUANTITIES. The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

40-3 OMITTED ITEMS. The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item.

Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-4 EXTRA WORK. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work". Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-5 MAINTENANCE OF TRAFFIC. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration.

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire- rescue equipment, or maintenance vehicles at the airport.

c. When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-6 REMOVAL OF EXISTING STRUCTURES. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-7 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, the Contractor may at his or her option either:

a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the Engineer; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-8 FINAL CLEANUP. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property Owner.

END OF SECTION 40

SECTION 50
CONTROL OF WORK

50-1 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

50-2 CONFORMITY WITH PLANS AND SPECIFICATIONS. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-3 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs);

contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the Engineer for an interpretation and decision, and such decision shall be final.

50-4 COOPERATION OF CONTRACTOR. The Contractor will be supplied with three copies each of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the Engineer and his or her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his or her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

50-5 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his or her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join his or her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-6 CONSTRUCTION LAYOUT AND STAKES. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): **electronic CAD format (.dwg or .dgn).** In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not

concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking

b. Rough Grade slope stakes at 100-foot (30-m) stations

c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

d. Roadways – minimum three (3) per station

Base Course blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot (30-m) stations.

b. Between Lifts at 25-foot (7.5-m) stations for the following section locations:

(1) Runways – each paving lane width
(2) Taxiways – each paving lane width
(3) Holding areas – each paving lane width

c. After finish paving operations at 50-foot (15-m) stations:

(1) All paved areas – Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.

e. Fence lines at 100-foot (30-m) stations minimum.

f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach

Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.

g. Drain lines, cut stakes and alignment on 25-foot (7.5-m) stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).

i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet (120 m) per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

50-7 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-8 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors are authorized to notify the Contractor or his or her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for a decision.

50-9 INSPECTION OF THE WORK. All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform

to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection 70-14 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been established by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as established by the Engineer, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.
In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

50-14 PARTIAL ACCEPTANCE. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer may

accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 FINAL ACCEPTANCE. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60
CONTROL OF MATERIALS

60-1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection: **see construction drawings.**

60-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS. Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-3 CERTIFICATION OF COMPLIANCE. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, the Contractor shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-4 PLANT INSPECTION. The Engineer or his or her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-5 ENGINEER'S FIELD OFFICE. The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be

separate from any building used by the Contractor. The Contractor shall furnish photocopy machine, water, sanitary facilities, heat, air conditioning, wireless internet access and electricity The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable to the Engineer to inspect the workmanship and materials used into the work.

60-6 STORAGE OF MATERIALS. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property Owner's permission.
All storage sites on private or airport property shall be restored to their original condition by the Contractor at his or her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-7 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

60-8 OWNER FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-2 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-3 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-4 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated as follows:

Owner	*Person to Contact (Phone Number)*
Jefferson County (Jack Brooks Regional Airport	*Duke Youmans (409) 719-4900*
Federal Aviation Administration	*James Terrel*

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-5 FEDERAL AID PARTICIPATION. For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-6 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

70-7 PUBLIC CONVENIENCE AND SAFETY. The Contractor shall control his or her operations and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches high. Unless otherwise specified, barricades shall be spaced not more than 4 feet apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor's parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-9 USE OF EXPLOSIVES. When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to

complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below:

- Contractor shall reference the Construction Safety and Phasing Plan for phasing/beneficial occupancy requirements.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2 (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his or her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS. As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the

Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are indicated as follows:

- Contractor shall reference section 70-04 of the General Provisions for utility location information.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70- 04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his or her surety.

70-15.1 FAA FACILITIES AND CABLE RUNS. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport manager a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 NO WAIVER OF LEGAL RIGHTS. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 ENVIRONMENTAL PROTECTION. The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the

Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

SECTION 80
EXECUTION AND PROGRESS

80-1 SUBLETTING OF CONTRACT. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least **25** percent of the total contract cost.

Should the Contractor elect to assign his or her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

80-2 NOTICE TO PROCEED. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-3 EXECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-4 LIMITATION OF OPERATIONS. The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

- The contractor shall reference the Construction Safety and Phasing Plans for all phases of the work.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction (see Special Provisions).

80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION. All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

80-5 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition

that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-6 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his or her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-7 DETERMINATION AND EXTENSION OF CONTRACT TIME. The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

b. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal.

Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period, *as detailed in the Special Provisions.* The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-8 FAILURE TO COMPLETE ON TIME. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted

sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
See Proposal and Contract		

The maximum construction time allowed for Schedules **[N/A]** will be the sum of the time allowed for individual schedules but not more than **[N/A]** days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-9 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his or her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason above, the Engineer shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be

liable and shall pay to the Owner the amount of such excess.

80-10 TERMINATION FOR NATIONAL EMERGENCIES. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his or her responsibilities for the completed work nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS. The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of **400** feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within **250** feet of an active runway at any time.

END OF SECTION 80

SECTION 90
MEASUREMENT AND PAYMENT

90-1 MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions. Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 lb (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-2 SCOPE OF PAYMENT. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-3 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-4 PAYMENT FOR OMITTED ITEMS. As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-5 PAYMENT FOR EXTRA WORK. Extra work, performed in accordance with the subsection 40-04 titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-6 PARTIAL PAYMENTS. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

When at least 95% of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-7 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-8 PAYMENT OF WITHHELD FUNDS. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-9 ACCEPTANCE AND FINAL PAYMENT. When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, and after the Engineer's receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances.

Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 CONSTRUCTION WARRANTY.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or
(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within **7** days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 30 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 PROJECT CLOSEOUT. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual.

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90

SECTION 100
CONTRACTOR QUALITY CONTROL PROGRAM

100-1 GENERAL. When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

a. Adequately provide for the production of acceptable quality materials.

b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.

c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

Paving projects over $250,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner's representative and the FAA prior to or at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

100-2 DESCRIPTION OF PROGRAM.

a. General description. The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. QUALITY CONTROL PROGRAM. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least **10** calendar days before the **associated work begins**. The Contractor's Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

a. Quality control organization

b. Project progress schedule

c. Submittals schedule

d. Inspection requirements

e. Quality control testing plan

f. Documentation of quality control activities

g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

100-3 QUALITY CONTROL ORGANIZATION. The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Program Administrator shall be a full-time on-site employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).

(5) Highway materials technician certified at Level III by NICET.

(6) Highway construction technician certified at Level III by NICET.

(7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. Quality control technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.

(2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.

(3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

100-4 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

100-5 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 INSPECTION REQUIREMENTS. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-7 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (for example, P-401)

b. Item description (for example, Plant Mix Bituminous Pavements)

c. Test type (for example, gradation, grade, asphalt content)

d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (for example, plant technician)

g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

100-8 DOCUMENTATION. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description
(2) Compliance with approved submittals
(3) Proper storage of materials and equipment
(4) Proper operation of all equipment
(5) Adherence to plans and technical specifications
(6) Review of quality control tests
(7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-9 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action

shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

100-11 NONCOMPLIANCE.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

(1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

END OF SECTION 100

SECTION 105 MOBILIZATION

105-1 DESCRIPTION. This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 POSTED NOTICES. Prior to commencement of construction activities the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-2 BASIS OF MEASUREMENT AND PAYMENT. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

END OF SECTION 105

SECTION 110
METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-1 GENERAL. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot values within the lot by using the following formula:

$$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$$

Where: X = Sample average of all sublot values within a lot
x_1, x_2 = Individual sublot values
n = Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2) / (n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot values in the set
d_1, d_2 = Deviations of the individual sublot values x_1, x_2,.. from the average value X that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X)$ ... $d_n = (x_n - X)$
n = Number of sublots

f. For single sided specification limits (that is, L only), compute the Lower Quality Index Q_L by use of

the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with QL, using the column appropriate to the total number (n) of measurements. If the value of QL falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (that is, L and U), compute the Quality Indexes QL and QU by use of the following formulas:

$$Q_L = (X - L) / S_n$$

And

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit
P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project
Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60
A-2 = 97.55
A-3 = 99.30
A-4 = 98.35
n = 4

2. Calculate average density for the lot.

$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$
X = (96.60 + 97.55 + 99.30 + 98.35) / 4
X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)2)) / (4 - 1)]^{1/2}$
$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$
$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

   $Q_L = (X - L) / S_n$
   $Q_L = (97.95 - 96.30) / 1.15$
   $Q_L = 1.4348$

5. Determine PWL by entering Table 1 with QL= 1.44 and n= 4.

   PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

   A-1 = 5.00
   A-2 = 3.74
   A-3 = 2.30
   A-4 = 3.25

2. Calculate the average air voids for the lot.

   $X = (x_1 + x_2 + x_3 \ldots x_n) / n$
   $X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
   $X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

   $S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$
   $S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$
   $S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

   $Q_L = (X - L) / S_n$
   $Q_L = (3.57 - 2.00) / 1.12$
   $Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and n = 4.

   PL = 97

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

   $Q_U = (U - X) / S_n$
   $Q_U = (5.00 - 3.57) / 1.12$
   $Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

   $P_U = 93$

8. Calculate Air Voids PWL

PWL = (P_L + P_U) - 100
PWL = (97 + 93) - 100 = 90

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project
Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30
A-4 = 98.35
A-2 = 97.55
A-1 = 96.60

2. Use n=4 and upper 5% significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

a. For measurements greater than the average:

If (measurement - average) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier

For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

b. For measurements less than the average:

If (average - measurement) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier.

For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

Less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420

96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566

43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

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SPECIAL PROVISIONS

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SECTION A – FEDERAL AVIATION ADMINISTRATION REQUIREMENTS

A-01 GENERAL CIVIL RIGHTS PROVISIONS

The contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

This provision also obligates the tenant/concessionaire/lessee or its transferee for the period during which Federal assistance is extended to the airport through the Airport Improvement Program, except where Federal assistance is to provide, or is in the form of personal property; real property or interest therein; structures or improvements thereon.

In these cases the provision obligates the party or any transferee for the longer of the following periods:

(a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits; or
(b) the period during which the airport sponsor or any transferee retains ownership or possession of the property.

A-02 CIVIL RIGHTS – TITLE VI ASSURANCES

Title VI Solicitation Notice:
The Owner, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the **Title VI List of Pertinent Nondiscrimination Statutes and Authorities**, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

   a. Withholding payments to the contractor under the contract until the contractor complies; and/or

   b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

A-03 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein
.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   A. Timetables

   B. Goals for minority participation for each trade (Vol. 45 Federal Register pg. 65984 10/3/80)

   C. Goals for female participation in each trade (6.9%)

These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor is also subject to the goals for both federally funded and non-federally funded construction regardless of the percentage of federal participation in funding.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities

and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is the Jefferson County, Texas.

A-04 ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A-05 BUY AMERICAN CERTIFICATION

See Section 010470 "Bidder Certifications" for Contractor Buy American Certification.

A-06 DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

Prompt Payment (§26.29))- The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from Owner. The prime contractor agrees further to return retainage payments to each subcontractor within {specify the same number as above} days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

A-07 ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

A-08 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance

to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Federal Fair Labor Standards Act (29 USC 201)	U.S. Department of Labor – Wage and Hour Division

A-09 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder or offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A-10 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Occupational Safety and Health Act of 1970 (20 CFR Part 1910)	U.S. Department of Labor – Occupational Safety and Health Administration

A-11 RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this contract are subject to requirements and regulations issued by the FAA and the Sponsor of the Federal grant under which this contract is executed.

A-12 TRADE RESTRICTION CLAUSE

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;

c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001

A-13 VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference must be given to Vietnam era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns owned and controlled by disabled veterans as defined in Title 49 United States

Code, Section 47112. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

A-14 COPELAND "ANTI-KICKBACK" ACT

The United States Department of Labor Wage and Hours Division oversees the Copeland "Anti-Kickback" Act requirements. All contracts and subcontracts must meet comply with the Occupational Safety and Health Act of 1970.

United States Department of Labor Wage and Hours Division can provide information regarding any specific clauses or assurances pertaining to the Copeland "Anti-Kickback" Act requirements required to be inserted in solicitations, contracts or subcontracts.

A-15 DAVIS-BACON LABOR PROVISIONS

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent

by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2 Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the

contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;
(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or

indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize

apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts.

The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

A-16 TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the Contractor must promote policies and initiatives for employees and other work personnel that decrease crashes by distracted drivers, including policies to ban text messaging while driving. The Contractor must include these policies in each third party subcontract involved on this project.

A-17 EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and

applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the

administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 18.7a through 18.7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract

Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the

company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such a superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (18.7a through 18.7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 18.7a through 18.7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith

effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 18.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A-18 NOTICE OF NONSEGREGATED FACILITIES REQUIREMENT

Notice to Prospective Federally Assisted Construction Contractors:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the

forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

A-19 TERMINATION OF CONTRACT

a. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services must be immediately discounted (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.

b. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price will be made, but no amount will be allowed for anticipated profit on unperformed services.

c. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor is liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.

d. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination will be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price will be made as provided in paragraph 2 of this clause.

e. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

A-20 CERTIFICATE REGARDING DEBARMENT AND SUSPENSION

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

CERTIFICATION REGARDING DEBARMENT AND SUSPENSION (SUCCESSFUL BIDDER REGARDING LOWER TIER PARTICIPANTS)

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov

2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.

3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

A-21 BREACH OF CONTRACT

Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

A-22 CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

2. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued thereunder;

3. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;

4. To include or cause to be included in any construction contract or subcontract which exceeds $100,000 the aforementioned criteria and requirements.

A-23 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2 .Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 above, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 above.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 above.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION B – STATE TERMS AND CONDITIONS

B-01 NOT USED

SECTION C – LOCAL TERMS AND CONDITIONS

C-01 CONTRACTOR'S INSURANCE

Contractor shall obtain insurance of the types and in the amounts described below. The insurance shall be written by insurance companies and on forms acceptable to Owner.

Owner and Garver, LLC shall be included as an insured under the CGL, (using ISO Additional Insured Endorsement CG 20 10 11 85 or a substitute providing equivalent coverage), and under the commercial automobile liability (using ISO Additional Insured Endorsement CA 2048 or a substitute providing equivalent coverage), and commercial umbrella, if any. This insurance, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Commercial General and Umbrella Liability Insurance: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than $5,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to the Project.

CGL insurance shall be written on ISO occurrence form CG 20 10 (11-85) (or a substitute combination of the following forms CG 20 10 (10-01) and CG 20 37 (10-01) providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury and liability assumed under an insured contract.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or amending the contractual coverage in the ISO occurrence form.

CGL insurance shall be written with an ISO form CG 25 03 05 09 Designated Construction Project(s) General Aggregate Limit or a substitute form providing equivalent coverage.

Continuing CGL Coverage: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance, with a limit of not less than $5,000,000 each occurrence for at least 3 years following substantial completion of the Work.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed Work equivalent to that provided under ISO form CG 00 01.

Owner's and Contractor's Protective Liability Insurance: Contractor shall maintain Owner's and Contractor's Protective Liability (OCP) insurance on behalf of Owner and Garver, LLC, as named insured, with a limit of $1,000,000.

Railroad Protective Liability Insurance: Not applicable.

Commercial Auto and Umbrella Liability Insurance: Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than $1,000,000 each accident.

Such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos).

Commercial auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

If the Contract Documents require Contractor to remove and haul hazardous waste from the Project site, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under the ISO Pollution Liability-Broadened Coverage for Covered Autos Endorsement (CA 99 48) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

Workers' Compensation Insurance: Contractor shall maintain workers' compensation and employer's liability insurance.

1 Definitions:

1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Contractor's Insurance requirements above.

4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 1. – 7. with the certificates of coverage to be provided to the person for whom they are providing services.

10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

The employer's liability, and if necessary commercial umbrella, limits shall not be less than $500,000 each accident for bodily injury by accident or $500,000 each employee for bodily injury by disease.

If Contractor leases its employees, the alternate employer endorsement (WC 00 03 01 A) shall be attached showing Owner in the schedule as the alternate employer.

Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy.

Where applicable, Nonappropriated Fund Instrumentalities Act (NFIA) shall be attached to the policy. NFIA extends the coverage of the Longshore and Harbor Workers' Compensation Act to civilian employees working on United States military bases throughout the world who are not paid with funds appropriated by Congress. These employees, working in facilities operated for the comfort, contentment, and improvement of armed forces personnel, are instead compensated with funds generated from earnings of their facility.

Where applicable, Outer Continental Shelf Lands Act Endorsement shall be attached to the policy.

Where applicable, the Maritime Coverage Endorsement shall be attached to the policy.

If project is located in a state where workers compensation is secured via monopolistic state funds, include evidence of the "Stop Gap" endorsement to the general liability policy.

Property Insurance: If applicable, Contractor shall purchase and maintain property insurance for the Work. Such insurance shall be written in an amount at least equal to the initial contract sum as well as subsequent modifications of that sum. The insurance shall apply on a replacement cost basis. If the insurance obtained in compliance with this paragraph is builders risk insurance, coverage shall be written on a completed value form.

The property insurance as required above shall name as insureds the Owner, Contractor, and all subcontractors and sub-subcontractors on the Project.

Primary and Non-contributory: Contractor agrees that the insurance listed above, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Waiver of Subrogation: Contractor waives all rights against the Owner and Garver, LLC and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability, commercial umbrella liability insurance, automobile liability insurance and workers compensation insurance maintained pursuant to paragraph C-01 of this agreement.

No Implied Waiver: Contractor shall furnish certifications matching the coverage requirements. Failure of Owner or Engineer to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner or Engineer to identify a deficiency from evidence that is provided shall not be construed as a waiver of the contractors obligations to furnish and maintain such insurance, or as a waiver to the enforcement of any of the provisions at a later date.

Any waiver of the contractor's obligation to furnish such certificate or maintain such evidence must be by written change order and signed by a Managing Member (Officer) of the Engineer and the Owner.

Cancellation, Non-Renewal, and/or Impairment Notification: The Contractor shall not cause any insurance policy to be cancelled or permit it to lapse and all insurance policies shall include an endorsement to the effect that the insurance policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance until notice has been mailed to the Owner and Engineer, stating the date when such cancellation or reduction shall be effective, which

date shall not be less than (60) days after such notice.

The amount shown in the bid item for the Owner's Protective Insurance shall include that amount of additional premium required for obtaining Owner's and Engineer's Protective Liability insurance for the Owner and Garver, LLC. The Engineer has the right to request justification from the contractor for the full amount of the cost included under the items "Owner's Protective Insurance".

Notice shall be sent via email and regular mail to the following persons and addresses:

Owner:
Alex Rupp
5000 Jerry Ware Drive
Beaumont, TX 77705
ARupp@co.Jefferson.tx.us

Garver:
Thomas Dodson, PE
Garver, LLC
12141 Wickchester
Suite 640
Houston, TX 77079
TDDodson@GarverUSA.com

C-02 UTILITIES

All work in this contract shall be in accordance with the Texas Underground Facilities Damage Prevention Act. The Contractor shall abide by the most current edition of this Act.

Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown.

The Contractor shall be responsible for the protection of all existing utilities or improvements crossed by or adjacent to his construction operations. Where existing utilities or service lines are cut, broken, or damaged, the Contractor shall replace or repair immediately the utilities or service lines with the same type of original material and construction or better, at his own expense.

C-03 LEGAL HOLIDAYS

Holidays that shall be observed are the following: New Year's Day (January 1); Memorial Day (last Monday in May); Independence Day (July 4); Labor Day (1st Monday in September); Thanksgiving Day (4th Thursday in November); and Christmas Day (December 25); no other days will be so considered. If a holiday falls on a Saturday or Sunday, the observed day shall be the Friday preceding the Saturday or the Monday following the Sunday. No construction observation will be furnished on legal holidays or Sundays, except in an emergency. The Contractor shall observe these legal holidays and all Sundays, and no work shall be performed on these days except in an emergency. Calendar day contract time includes delays for all holidays. Refer to Section C-06 for more information.

C-04 CLEAN UP

From time to time, the Contractor shall clean up the site, including any work areas at the airport, in order that the site presents a neat appearance and the progress of the work not be impeded. One such period of clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary plant, equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

C-05 PROJECT MEETINGS AND COORDINATION

A preconstruction conference will be called by the Engineer at a time convenient to the Owner and before the issuance of the "Notice to Proceed". The Engineer and the Contractor and such subcontractors as the Contractor may desire shall attend this meeting with the Owner.

The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this Contract. The Contractor shall attend all such conferences. This in no way relieves the Contractor of his responsibility to fully coordinate his work under this Contract.

C-06 LIQUIDATED DAMAGES FOR DELAY

The number of calendar days allowed for completion of the project is stipulated in the Proposal and in the Contract and shall be known as the Contract Time. The Contractor agrees that time is a critical element for this Contract. Loss will accrue to the Owner due to delayed completion of the work; and the cost to the Owner of the administration of the Contract, including engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The Contractor agrees that for each day of delay beyond the number of calendar days herein agreed upon for the completion of the work herein specified and contracted for, the Owner may withhold, permanently, from the Contractor's total compensation, the sum of **One**

Thousand Dollars (**$1,000.00**) as stipulated damages for each day of such delay. Should the amount otherwise due the Contractor be less than the amount of such ascertained and liquidated damages, the Contractor and his Surety shall be liable to the Owner for such deficiency.

It is understood and agreed by and between the Owner and the Contractor that the time of completion herein set out is a reasonable time. The Contractor shall perform fully, entirely, and in an acceptable manner, the work contracted for within the contract time stated in the Contract. The contract time shall be counted from ten days after the effective date of the "Notice to Proceed", or the date work commences, whichever occurs first; and shall include all Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of any orders of the Engineer for suspension of the prosecution of the work, due to the fault of the Contractor, shall be counted as elapsed contract time, and shall not be considered for an extension of time.

Extensions of time for completion, under the condition of 3(a) next below, will be granted; extensions may be granted under other stated conditions:

1. If the satisfactory execution and completion of the Contract shall require work or material in greater amounts or quantities than those set forth in the Contract, then the Contract time shall be increased in the same proportion as the additional work bears to the original work contracted for.

2. An average or usual number of inclement weather days, when work cannot proceed, is to be anticipated during the construction period and is not to be considered as warranting extension of time. The days included in the contract time for Normal Weather-Related Events and holidays are as follows:

(On A Monthly Basis)

Month	Normal Weather-Related Events
January	5
February	7
March	4
April	4
May	3
June	4
July	8
August	4
September	6
October	5
November	2
December	5

If, however, it appears that the Contractor is delayed by conditions of weather, outside of normal weather-related events detailed in the proceeding table, extensions of time may be granted.

3. Should the work under the Contract be delayed by other causes which could not have been prevented or contemplated by the Contractor, and which are beyond the Contractor's power to prevent or remedy, an extension of time may be granted. Such causes of delay shall include but not necessarily be limited to the following:

   a. Acts of God, acts of the public enemy, acts of the Owner except as provided in these Specifications, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather.

b. Any delays of Subcontractors or suppliers occasioned by any of the causes specified above.

The Engineer or other authorized representative of the Owner shall keep a written record sufficient for determination as to the inclusion of that day in the computation of Contract time. This record shall be available for examination by the Contractor during normal hours of work as soon as feasible after the first of each construction month. In case of disagreement between the representative of the Owner and the Contractor, as to the classification of any day, the matter shall be referred to the Owner whose decision shall be final.

If the Contractor finds it impossible for reasons beyond his control to complete the work within the Contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the Contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may recommend to the Owner that the contract time be extended as conditions justify. If the Owner extends the contract, the extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

The amount of all extensions of time for whatever reason granted shall be determined by the Owner. In general, only actual and not hypothetical days of delay will be considered. The Owner shall have authority to grant additional extensions of time as the Owner may deem justifiable.

C-07 QUALITY ASSURANCE/MATERIALS TESTING

The Owner shall be responsible for quality assurance testing as stated in theses specifications; however, the Contractor shall be responsible for payment of any subsequent tests made necessary by previous unsatisfactory tests. In this event, the Owner's quality assurance representative shall conduct the additional testing and payment for such tests shall be directly deducted from the Contractor's payment. The Contractor shall pay for additional testing at the Owner's contract rate.

C-08 RECORD DOCUMENTS

The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, Shop Drawings and samples at the site, in good order, and annotated to show all changes made during the construction process. In addition, the Contractor shall note any differences between locations of underground existing facilities shown in the plans and the actual location located during construction. These record documents shall be available to the Engineer for examination and shall be delivered to the Engineer upon completion of the work.

C-09 CONTRACTOR/SUBCONTRACTOR/SUPPLIER LEGAL DISPUTES

Any fees, expenses, charges, fines or other costs borne by the Owner as a result of legal disputes or lawsuits between the contractor and his subcontractors, or between the contractor and his suppliers, shall be deducted from monies due or which may thereafter become due the contractor.

C-10 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements embraced in this contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of final acceptance of the work. The Contractor will be responsible for all costs associated with construction observation and oversight for the repair work. The Owner will give notice of defective materials and work with reasonable promptness. In the event repair work is required, the

Contractor shall remedy any defects and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of the acceptance of the repair work.

C-11 CONTRACTOR'S RELEASE AND AFFIDAVIT

At the project's completion, the Contractor shall execute the attached Release and Lien Waiver to release all claims against the Owner arising under and by virtue of his Contract. The date of the Release shall be that agreed to for the final acceptance of the project with the Owner.

C-12 SUBMITTALS

The Contractor shall prepare and submit information required by the individual Specification sections sufficiently in advance of the related work to allow an appropriate review time by the Engineer. The types of submittals are indicated in the individual Specification sections.

During the preconstruction conference, the Contractor shall review his submittal schedule and procedures, including notifying the Engineer whether electronic submittals or paper submittals will be provided for all submittal packages in the project. Mixing of package types will not be allowed. The Contractor shall provide one of the following submittal package types:

1. Submit electronic submittals via email as PDF electronic files directly to the Engineer's designated representative, or post these PDF electronic files directly to the Engineer's FTP site specifically established for this project. Electronic submittals shall be in Adobe Acrobat (*.PDF) format and shall be legible when printed.

2. Submit six (6) paper submittal copies via mail or other courier service to the Engineer's designated representative.

Submittals shall be neat, organized, and easy to interpret. Assemble complete submittal package into a single indexed electronic file or hard cover bound book, incorporating submittal requirements of an individual Specification section, the transmittal form with unique submittal numbering system, and electronic links or tabs enabling navigation to each item. Unless approved otherwise by the Engineer, all submittals for the individual Specification section shall be submitted at one time.

Submittals must come directly from the Prime Contractor; submittals from subcontractors or suppliers will not be reviewed.

Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Faxed submittals or submittals with extremely small or otherwise unreadable print will not be accepted. Submittals not required by the Contract Documents will be returned by the Engineer without action.

The Contractor shall retain complete copies of submittals on project site. Use only final submittals that are marked with approval notation from Engineer's submittal review stamp with comments form.

Resubmittals shall continue the unique, sequential, submittal numbering system. Resubmittals without unique numbering, example resubmittals transmitted as 005A or 005REV, are unacceptable and will be returned un-reviewed.

C-13 STORMWATER POLLUTION PREVENTION PLAN

Refer to Technical Specification P-156.

C-14 TEST BORINGS/SUBSURFACE INFORMATION

A geotechnical investigation and soils report have been completed for the project area and are available upon request. This information can be obtained by contacting the Engineer.

Soil characteristics provided in any soil reports, or as shown on boring logs, are representative only at the location of the sample taken, and neither the Owner, Engineer nor Engineer's consultants will be responsible for variations in the soil characteristics at other locations. Any subsurface information or geotechnical reports made available to Contractor was obtained and intended for the Owner's design and estimating purposes only. Such reports and drawings are not Contract Documents.

The Contractor may not rely upon or make any claim against Owner, Engineer, or Engineer's Consultants with respect to (1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor and safety precautions and programs incident thereto, (2) other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings, or (3) any Contractor interpretation or other conclusion drawn from any data, interpretations, opinions, or information.

If in any case, the recommendations set forth in the Geotechnical Report conflict with the requirements set forth in these Contract Documents, the requirements in the Contract Documents shall take precedent.

C-15 WAGE RATES

The Davis Bacon minimum wage rates for this project are applicable and included in Section L of this contract.

END OF SPECIAL PROVISIONS

RELEASE OF LIEN

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

DATE OF CONTRACT: _____

Upon receipt of the final payment and in consideration of that amount, the undersigned does hereby release the Owner and its agents from any and all claims arising under or by virtue of this Contract or modification thereof occurring from the undersigned's performance in connection with the

_____

_____

project.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

CONTRACTOR'S AFFIDAVIT

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

_____

DATE OF CONTRACT: _____

I hereby certify that all claims for material, labor, and supplies entered into contingent and incident to the construction or used in the course of the performance of the work on _____

_____

have been fully satisfied.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

The Surety Company consents to the release of the retained percentage on this project with the understanding that should any unforeseen contingencies arise having a right of action on the bond that the Surety Company will not waive liability through the consent to the release of the retained percentage.

Dated _____
Surety Company

By _____
Resident Agent, State of Texas

SECTION L
ADDENDA

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	1
Issued (Date):	July 25, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Rescheduled Walk-Throughs & Cut-off Date for Responses to Question Submissions

- **Property Walk-Throughs**

Please note that the original walk-through scheduled for Tuesday, July 25, 2017 *has been rescheduled.* Bidders will now have (2) opportunities to walk-through the airport property and view secured areas of the project, as follows:

Thursday, July 27, 2017 – 10:00 am CDT
Thursday, July 27, 2017 – 1:00 pm CDT

Bidders are to meet at the Jack Brooks Regional Airport, Administration Office (Lobby), 5000 Jerry Ware Blvd., Beaumont, Texas 77705.

This will be the bidder's only opportunity to walk-through the property and view secured areas of the project.

- **Cut-off Date for Responses to Question Submissions**

Bidders must submit technical questions via email to Colin Bible, Project Manager with Garver, LLC. at CMBible@GarverUSA.com **by 5:00 pm CDT, Tuesday, August 1, 2017** in order to receive a response.

Addendum No. 1 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Jackie Christopher
Witness

Sherri Sanders
Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)
T.W. HARRISON
PRESIDENT
Title of Person Signing Above

ALLCO
Typed Name of Business or Individual

PO BOX 3684, BEAUMONT, TX 77704
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT

1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	2
Issued (Date):	August 2, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Updating DBE Goals, Documenting Pre-Bid Meeting, and Updating existing electrical structure final grades.

- **Updating DBE Goals**

Please find attached the updated DBE Participation Forms. This reflects the new DBE Goals to be met.

- **Documenting Pre-Bid Meeting**

Please find attached the Pre-Bid meeting Agenda and the Pre-Bid meeting sign-in sheet.

- **Updating electrical structure final grades**

Please find attached the electrical drawings for the elevation adjustment of the electrical hand hole. This additional work warranted an update in the L-115 technical specification and pay item (L-115-5.3). The new L-115 specification is attached to this addendum along with the bid form featuring the updated pay item. Furthermore, the FAA-C-1391d specification governing the aforementioned adjustment has been added and so is the updated list of technical specifications.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Jackie Christopher
Witness

Sherri Sanders
Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)

T.W. HARRISON
PRESIDENT
Title of Person Signing Above

ALLCO
Typed Name of Business or Individual

PO BOX 3684, BEAUMONT, TX 77704
Address

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: _____ DBE: ☐ Yes ☐ No

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____

Prime Contract Amount: $_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

_____ _____ _____
Printed Name of Contractor Representative Signature of Representative Date

_____ _____ _____
Printed Name of DBE Signature of Representative Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Prime Contractor: _____ DBE: ☐ Yes ☐ No

DBE Status (Gender & Ethnicity): _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____ IFB/RFP No.: _____

Total Contract: $ _____ Total DBE Subcontract(s): $ _____

Construction DBE Goals: 12.90% DBE:: _____ %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☐ Other: _____

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☐ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required.** I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): _____

Title: _____

Signature: _____

Date: _____

E-mail address: _____

Contact person that will be in charge of invoicing for this project:

Name (print or type): _____

Title: _____

Date: _____

E-mail address: _____

Bidder Shall Return Completed Form with Offer.

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

TEL 972.377.7480

www.GarverUSA.com

Jack Brooks Regional Airport – Taxiway D Reconstruction (2017) Ware Ramp to TW 'F' Pre-Bid Meeting

10:00 a.m. July 25, 2017

1) **Introductions & Roles:**
   a) Alex Rupp, Airport Manager, Jack Brooks Regional Airport (Owner)
   b) Duke Youmans, Operations Manager, Jack Brooks Regional Airport
   c) Megan Landry, Finance Manager, Jack Brooks Regional Airport
   d) Jamey West, Assistant Purchasing Agent, Jefferson County
   e) Colin Bible, PE, Senior Project Manager, Garver

2) **Bidding Procedures**
   a) Bids proposals are due no later than 11:00 am local time on August 8, 2016 at the Jefferson County Purchasing Division, 1149 Pearl Street, 1st Floor, Beaumont, Texas 77701. After the cut-off time, bids will be publicly opened and read. DO NOT DELIVER BID PACKAGES TO THE AIRPORT – THEY WILL BE CONSIDERED NON-RESPONSIVE.
   b) Instructions to Bidders. Requirements are detailed in this section.
      i) Bid package consisting of an entire project manual and 3 copies of the required documents
      ii) Vendor registration with System for Award Management
   c) Awarded Vendor requirement for Submission of Form 1295
   d) Bids may be held up to 90 days for FAA funding schedule.
   e) Bid Proposal. Contract Time:
      i) 279 Calendar Days; this is inclusive of typical weather days and holidays.
      ii) $1,000 per day Liquidated Damages thereafter.
      iii) Section K identifies included typical weather days per month.
   f) Contract Award

Base Bid – Taxiway D Reconstruction (2017)

3) **Federal Provisions**
   a) The DBE goal is 12.90%.
      i) Questions regarding goals and good faith efforts should be directed to Megan Landry at the airport.

4) **FAA General Provisions**
   a) 7/21/2014 version of the provisions are included in the project manual portion of the bid documents.
   b) Section 110 covers the calculation of "Percent Within Limits" for concrete pavement pay factors.

5) **Plans and Technical Specifications**
   a) Plansheets G-301 to G-305 for phasing plan and requirements. This project will close Runway 12/30 and Runway 16/34 during overnight hours and to non-commercial traffic during a 2-day period at the beginning of construction. Remaining project work will be done with the runway open to all traffic.
   b) Safety Plan Compliance Document SS-101 – this is a document requirement for working on the airfield.
   c) Concrete Pavement P-501 – this specification has been modified to allow side-form construction
   d) Subbase Course P-154 – for foundation beneath the concrete pavement
   e) Lime-Treated Subgrade – for foundation beneath the subbase course. A 6% dosage rate; 16" depth is anticipated to be windrowed in 2 lifts
   f) Refined Coal Tar Emulsion with Additives – Coating the ware ramp.
   g) Airport Lighting Systems SS-310 – for LED taxiway lighting fixtures

6) **Construction Security**
   a) Security background checks and driver training. These are to be provided by the Contractor at his own expense for employees that will be driving on the airfield.

7) **General Discussion / Question and Answer**

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Shawn Thurman	SpawGlass	409-681-4547	Shawn.thurman@spawglass.com
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Doug Stanton	Kwest Group	972 722 3874	DougStanton@kwestgroup.com
Brenda Baker	Hartmann Building	409-659-8225	bbaker@hbs[illegible].net
Duke Youmans	JBRA	409-719-4950	dyoumans@co.jefferson.tx.us
Megan Landry	JBRA	409-719-4900	MLANDRY@co.Jefferson.TX.US
Clovis Restrepo	Ez Demolitions Underground	(281)827-3673	cr@ezdemolitions.com
Javier Castro	Ez Demolition Under	713)5607215	javier@ezdemolitions.com

GARVER

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Artie Tucker	Gulf Coast	409-284-2598	awtucker@apsc.com
Bill Kelley	Martin Marietta	409-658-7791	William.Kelley@martinmarietta.com
Mike Kelley	MK Constructors	409-769-0089	Sales@MKconstructors.com
Brandon Harrison	Alico	409-860-4459	bharrison@alico.com
Blake Heisler	Brystar Contracting Inc	409-842-6768	ron@brystar.com

GARVER

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room
Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
James West	Jefferson Cty. Purchasing	409-835-8693	jwest@co.jefferson.tx.us
Rodney White	Texas Premier Services, LLC	409.782.4151	RLWHITETPS@GMAIL.com
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Lee Aitken	Holes Companies	281-898-1761	Lee@HolesInc.com

SYMBOL	ITEM DESCRIPTION
———	NEW EQUIPMENT
- - - - - -	EXISTING EQUIPMENT
×	EXISTING EQUIPMENT TO BE COMPLETELY DEMOLISHED AND REMOVED, AREA TO BE RESTORED
⊙	L-861T TAXIWAY EDGE LIGHT
⌂	L-852T IN-PAVEMENT TAXIWAY EDGE LIGHT
W○W	L-862 RUNWAY EDGE LIGHT, COLOR AS INDICATED
W○W	L-850C RUNWAY EDGE LIGHT, COLOR AS INDICATED
◘ ◙	BASE MOUNTED LIGHT
B	L-867B LIGHT BASE JUNCTION BOX
D	L-867D LIGHT BASE JUNCTION BOX
E	L-867E LIGHT BASE JUNCTION BOX
1	L-858 GUIDANCE SIGN, SEE SIGN INDEX
	L-807 WIND CONE WITH SEGMENTED CIRCLE
4W-4"	ELECTRICAL DUCT, NUMBER AND SIZE OF CONDUITS AS INDICATED
■	DUCT MARKER
H	HANDHOLE
M	MANHOLE
⏚	3/4" x 10' COPPER CLAD STEEL GROUND ROD
—//—	SERIES LIGHTING CIRCUIT WITH COUNTERPOISE, NUMBER OF HASH MARKS INDICATES NUMBER OF CABLES
→→	DRAIN CONDUIT
AFG	ABOVE FINISHED GRADE
AOA	AIRCRAFT OPERATIONS AREA
OFA	OBJECT FREE AREA
OFZ	OBSTACLE FREE ZONE
RSA	RUNWAY SAFETY AREA
TSA	TAXIWAY SAFETY AREA
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
UGN	UNLESS OTHERWISE NOTED
DEB	DIRECT EARTH BURIED

CAUTION NOTES:

1. UNDERGROUND UTILITIES EXIST WITHIN AND ADJACENT TO THE LIMITS OF CONSTRUCTION. AN ATTEMPT HAS BEEN MADE TO LOCATE THESE UTILITIES ON THE PLANS, HOWEVER, ALL EXISTING UTILITIES MAY NOT BE SHOWN AND THE ACTUAL LOCATIONS OF THE UTILITIES MAY VARY FROM THE LOCATIONS SHOWN. PRIOR TO BEGINNING ANY TYPE OF EXCAVATION, THE CONTRACTOR SHALL CONTACT THE UTILITIES INVOLVED AND MAKE ARRANGEMENTS FOR THE LOCATION OF THE UTILITIES ON THE GROUND. THE CONTRACTOR SHALL MAINTAIN THE UTILITY LOCATION MARKINGS UNTIL THEY ARE NO LONGER NECESSARY.
2. TEXAS STATE LAW, THE UNDERGROUND FACILITIES DAMAGE PREVENTION ACT, REQUIRES TWO WORKING DAYS ADVANCE NOTIFICATION THROUGH THE TEXAS ONE-CALL SYSTEM CENTER BEFORE EXCAVATING USING MECHANIZED EQUIPMENT OR EXPLOSIVES (EXCEPT IN THE CASE OF AN EMERGENCY). THE ONE-CALL SYSTEM PHONE NUMBER IS 1-800-245-4545. THE CONTRACTOR IS ADVISED THAT THERE IS A SEVERE PENALTY FOR NOT MAKING THIS CALL. NOT ALL UTILITY COMPANIES ARE MEMBERS OF THE TEXAS ONE-CALL SYSTEM; THEREFORE, THE CONTRACTOR IS ADVISED TO CONTACT ALL NON-MEMBER UTILITIES AS WELL AS THE ONE-CALL SYSTEM.

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL STAKE THE AIRFIELD LIGHTING SYSTEMS, PRIOR TO INSTALLATION OF ANY TRENCH, CABLE, OR LIGHTING APPARATUS. THE INTENT IS TO STAKE THE INSTALLATION AT THE LOCATIONS INDICATED, NOTING ANY DEVIATION FROM PLAN DIMENSIONS TO THE ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL OBTAIN THE SERVICES OF AN EXPERIENCED AND LICENSED SURVEYOR TO PERFORM THIS WORK.
2. THE ENGINEER SHALL PROVIDE ELECTRONIC CADD FILES TO THE CONTRACTOR FOR THIS STAKING WORK. THE CONTRACTOR SHALL STAKE THE ITEMS AND HIS SURVEYOR SHALL PROVIDE A CADD FILE SUBMITTAL BACK TO THE ENGINEER. BASED UPON THIS SUBMITTAL, THE ENGINEER SHALL COORDINATE AND PROVIDE DIRECTIONS ON ANY ADJUSTMENTS NECESSARY TO MEET EXISTING FIELD CONDITION REQUIREMENTS AND COMPLY WITH FAA ADVISORY CIRCULAR REQUIREMENTS ON THE LAYOUT AND SPACING OF EQUIPMENT.
3. THE CONTRACTOR AND HIS SURVEYOR SHALL THEN MAKE ANY ELECTRONIC CADD FILE SPACING ADJUSTMENTS AND / OR FIELD STAKING ADJUSTMENTS PRIOR TO INSTALLATION AT NO ADDITIONAL COST TO THE OWNER.
4. THE CONTRACTOR SHALL VERIFY EXACT PAVEMENT EDGE DIMENSIONS WITH THIS INITIAL SURVEY WORK.
5. THE CONTRACTOR SHALL FIELD MARK AND IDENTIFY TAXIWAY POINT OF TANGENCY (PT) AND INTERSECTION POINTS (IP) LOCATIONS WITH EMBEDDED BRASS MARKERS.
6. THE EXISTING AND THE PROPOSED LOCATIONS OF LIGHTING CABLES ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING THE EXISTING LIGHTING CIRCUITS TO DETERMINE THEIR EXACT ROUTING. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR MAINTAINING THE LIGHTING SYSTEMS IN A WORKING CONDITION UNTIL THE NEW LIGHTING CIRCUITS HAVE BEEN INSTALLED AND TESTED. THE CONTRACTOR SHALL PROACTIVELY AND EXPEDITIOUSLY ACCOMPLISH THIS CABLE IDENTIFICATION WORK PRIOR TO PERFORMING ANY MODIFICATIONS TO THE LIGHTING CIRCUITS. COORDINATE IDENTIFICATION WORK WITH THE OWNER AND ENGINEER AND MAKE ALL CORRECTIONS, ADDITIONS, ETC. ON THE AS-BUILT DRAWINGS.
7. THE CONTRACTOR SHALL BE EXTREMELY CAREFUL WHILE EXCAVATING IN THE AREA OF LIGHTING CIRCUITS. ANY CABLE OR CONDUIT / DUCT WHICH IS NICKED OR DAMAGED DURING EXCAVATION SHALL BE PROPERLY AND EXPEDITIOUSLY SPLICED OR THE LENGTH OF CABLE AND CONDUIT / DUCT REPLACED. A SPLICE OR CONDUIT / DUCT MARKER SHALL BE INSTALLED AT ALL SPLICE OR OTHER REPAIR LOCATIONS MORE THAN 2' AWAY FROM A LIGHT, SIGN, HANDHOLE, MANHOLE, OR JUNCTION STRUCTURE. ALL REPAIR AND / OR REPLACEMENT WORK AND MATERIALS SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER AND TO THE SATISFACTION OF THE OWNER AND ENGINEER.
8. ALL ELECTRICAL CABLES SHALL BE CLEARLY IDENTIFIED, LABELED, AND TAGGED AT ALL POINTS WHERE THEY ARE AVAILABLE FOR CONNECTIONS OR INSPECTION, INCLUDING, BUT NOT LIMITED TO MANHOLES, HANDHOLES, PULL BOXES, JUNCTION BOXES, AND LIGHT BASES.
9. THE CONTRACTOR SHALL PERFORM MEGGER TESTS ON EACH EXISTING SERIES CIRCUIT PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM AND EACH NEW AND EXISTING SERIES CIRCUIT AFTER THE ACCEPTANCE TEST PERIOD. MEGGER TESTING REQUIREMENTS SHALL BE SUBSIDIARY TO AND PAID FOR BY L-108 PAY ITEMS.
10. THE CONTRACTOR SHALL COORDINATE WITH THE ON-SITE ENGINEER FOR OWNER AND ENGINEER WITNESS OF ALL MEGGER TESTING. THE CONTRACTOR SHALL SUBMIT HIS INITIAL MEGGER TEST REPORTS TO THE OWNER AND ENGINEER PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM. THIS REPORT SHALL BE APPROVED AND SIGNED BY THE OWNER AND ENGINEER PRIOR TO THE CONTRACTOR PROCEEDING WITH HIS WORK.
11. THE CONTRACTOR SHALL CHECK THE LOAD ON EACH EXISTING REGULATOR PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM AND ON EACH EXISTING REGULATOR AFTER THE ACCEPTANCE TEST PERIOD.
12. THE CONTRACTOR SHALL CALIBRATE EACH EXISTING REGULATOR FOLLOWING THE PERFORMED WORK.
13. LOCKOUT / TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES SHALL BE PAID FOR BY SS-300 PAY ITEMS UNLESS OTHERWISE NOTED.
14. CONDUITS AND DUCTS UNDER PAVED AREAS SHALL BE CONCRETE ENCASED.
15. CONDUITS AND DUCTS UNDER NON-PAVED AREAS SHALL BE NON-ENCASED, UNLESS OTHERWISE NOTED.
16. DURING CONSTRUCTION, PROTECT ALL EQUIPMENT, DUCTS, CONDUITS, CABLES, ETC. THAT ARE TO REMAIN IN PLACE. WHERE EXISTING ITEMS ARE CUT, BROKEN, OR DAMAGED, THE CONTRACTOR SHALL REPLACE OR REPAIR PROACTIVELY AND EXPEDITIOUSLY THE ITEMS WITH THE SAME TYPE OF ORIGINAL MATERIAL AND CONSTRUCTION OR BETTER AT NO ADDITIONAL COST TO THE OWNER AND TO THE SATISFACTION OF THE OWNER AND ENGINEER.

ELECTRICAL SAFETY NOTES:

1. SERIES CIRCUITS CAN BE DANGEROUS AND / OR FATAL.
2. LOCKOUT / TAGOUT PROCEDURES SHALL BE FOLLOWED.
3. LIGHTING REGULATORS SHALL BE TURNED OFF, LOCKED, AND TAGGED OUT OF SERVICE BEFORE ANY WORK IS DONE ON THE SERIES CIRCUIT.
4. THE ELECTRICAL RESISTANCE AND INSULATION INTEGRITY OF EACH MODIFIED CIRCUIT SHALL BE TESTED BEFORE THE CIRCUIT IS ENERGIZED.

DEMOLITION KEYED NOTES:

1. REMOVE EXISTING STAKE-MOUNTED TAXIWAY EDGE LIGHT. (TYPICAL)
2. REMOVE EXISTING BASE MOUNTED TAXIWAY GUIDANCE SIGN. (TYPICAL)
3. DEMOLISH EXISTING ABANDONED CONCRETE GUIDANCE SIGN BASE.
4. EXISTING GUIDANCE SIGN TO REMAIN. (TYPICAL)
5. ABANDON EXISTING DEB SERIES CIRCUIT IN PLACE. (TYPICAL)
6. EXISTING TAXIWAY EDGE LIGHT TO REMAIN. (TYPICAL)
7. EXISTING RUNWAY EDGE LIGHT TO REMAIN. (TYPICAL)
8. REMOVE AND STORE EXISTING IN-PAVEMENT, ELEVATED TAXIWAY EDGE LIGHT. FILL EXISTING LIGHT BASE WITH CONCRETE.
9. REMOVE EXISTING AIRFIELD CIRCUIT AND ABANDON EXISTING CONDUIT SYSTEM.
10. EXISTING AIRFIELD CIRCUIT TO REMAIN. (TYPICAL)
11. DEMOLISH EXISTING 2' X 2' ELECTRICAL PULL BOX.
12. EXISTING ELECTRICAL DUCT BANK TO REMAIN. (TYPICAL)
13. EXISTING JUNCTION STRUCTURE TO REMAIN.
14. REMOVE EXISTING AIRFIELD CIRCUIT AND DEMOLISH ELECTRICAL DUCT BANK.
15. EXISTING FAA CABLE TO REMAIN. FIELD LOCATE PRIOR TO DEMOLITION AND PROTECT DURING CONSTRUCTION.
16. REMOVE EXISTING PRIMARY WIND CONE AND SEGMENTED CIRCLE. DEMOLISH BASE.
17. EXISTING IN-PAVEMENT RUNWAY EDGE LIGHT TO REMAIN.
18. EXISTING FAA COMMUNICATION DUCT BANK TO REMAIN.
19. DEMOLISH EXISTING ABANDONED WIND CONE BASE.
20. EXISTING WIND CONE CIRCUIT TO REMAIN. (TYPICAL)
21. REMOVE EXISTING AIRFIELD CIRCUIT FROM EXISTING ELECTRICAL DUCT BANK. ELECTRICAL DUCT BANK TO REMAIN.
22. EXISTING CONCRETE ENCASED FAA COMMUNICATION DUCT BANK. PROTECT DURING REMOVAL OF TAXIWAY PAVEMENT.
23. REMOVE EXISTING DUCT MARKER.
24. REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN.
25. EXISTING ABANDONED SIGN BASE TO REMAIN.
26. EXISTING DUCT MARKER TO REMAIN.
27. EXISTING DIRECT EARTH BURIED FAA-OWNED COMMUNICATIONS CABLE TO REMAIN.
28. REMOVE AND EXISTING GUIDANCE SIGNS AND ISOLATION TRANSFORMERS. RECONNECT EXISTING RUNWAY CIRCUIT. ABANDON SIGN FOUNDATION IN PLACE.

INSTALLATION KEYED NOTES:

1. INSTALL NEW L-861T(L) BASE-MOUNTED TAXIWAY EDGE LIGHT. (TYPICAL)
2. INSTALL NEW TRENCH TYPE "A". (TYPICAL)
3. INSTALL NEW TRENCH TYPE "B". (TYPICAL)
4. INSTALL NEW BASE-MOUNTED L-858(L) GUIDANCE SIGN, SEE SHEET E-311 FOR SIGN INDEX.
5. CORE DRILL EXISTING LIGHT BASE FOR CONNECTION OF NEW CIRCUIT TO EXISTING CIRCUIT.
6. INSTALL NEW TRENCH TYPE "C".
7. INSTALL NEW TRENCH TYPE "D". (TYPICAL FOR NEW WINDCONE CIRCUIT)
8. INSTALL NEW 2 FT WATERTIGHT CONDUIT STUB-OUT FOR CONNECTION OF DEB CIRCUIT TO NEW LIGHT BASE.
9. INSTALL NEW SURGE ARRESTOR IN LINE WITH THE SERIES CIRCUIT. INSTALL BRASS INPAVEMENT MARKER ON CONCRETE LIGHT BASE ENGRAVED WITH "SA".
10. INSTALL NEW CONCRETE ENCASED L-867D JUNCTION STRUCTURE WITH STUBOUTS INDICATED.
11. NEW TAXIWAY LIGHTS SHALL VARY IN DISTANCE FROM TAXIWAY EDGE TO MATCH NEW TAXIWAY LIGHT OFFSET TO EXISTING TAXIWAY LIGHT OFFSET.
12. ADJUST EXISTING FAA-MANHOLE TO NEW GRADE AND INSTALL NEW MANHOLE COVER.
13. INSTALL NEW CONCRETE ENCASED L-867B JUNCTION STRUCTURE WITH STUBOUTS INDICATED. CONNECT TO EXISTING PRIMARY WIND CONE CONDUIT SYSTEM.
14. INSTALL NEW L-807(L) INTERNALLY LIT PRIMARY WIND CONE AND SEGMENT CIRCLE.
15. INSTALL NEW L-852T(L) FLUSH-MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT IN EXISTING PAVEMENT.
16. CONSTRUCT NEW 2-WAY 2"C CONCRETE ENCASED DUCT BANK.
17. INSTALL NEW FAA-STYLE DUCT MARKERS.
18. CONNECT NEW CONDUIT TO EXISTING BASE MOUNTED GUIDANCE SIGN. INSTALL NEW ISOLATION TRANSFORMER, CONNECTORS, NEW LAMPS, AND NEW SECONDARY EXTENSION CORD.
19. EXISTING FAA-OWNED MANHOLE TO REMAIN.
20. INSTALL NEW 2-WAY 2"C DIRECTIONAL BORE UNDER EXISTING PAVEMENT. EXTEND 15' BEYOND PAVEMENT EDGE.
21. INSTALL NEW TRENCH TYPE "E". (TYPICAL FOR DEB CIRCUIT)
22. INSTALL NEW AIRFIELD CONDUCTORS IN EXISTING CONDUIT.
23. CORE DRILL EXISTING OR NEW STORM DRAIN PIPE AND CONNECT NEW DRAINAGE CONDUIT.
24. CORE DRILL EXISTING OR NEW INLET STRUCTURE AND CONNECT NEW DRAINAGE CONDUIT.
25. INSTALL DRAINABLE AGGREGATE AREA AT INDICATED EDGE LIGHT. SEE DRAIN NOTE ON SHEET E-306, DETAIL 3, NOTE 4.
26. CONSTRUCT NEW 2-WAY 2"C NON-ENCASED DUCT BANK.
27. INSTALL NEW L-861T(L) BASE-MOUNTED TAXIWAY EDGE LIGHT WITHIN EXISTING CONCRETE PAVEMENT.
28. INSTALL NEW TRENCH TYPE "F".
29. LOCATE AND SPLIT DUCT ENCASE FAA COMMUNICATIONS CABLE WITH 3" CONCRETE ENCASED CONDUIT.
30. INSTALL NEW VEHICLE SIGN ASSEMBLY.
31. CONNECT NEW CONDUIT TO EXISTING JUNCTION STRUCTURE.

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS — MATTHEW C. LEMAY — 112369 — LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/02/2017

REV.	DATE	DESCRIPTION	BY
1	08/02/17	ADDENDUM NO. 2	MCL

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

ELECTRICAL LEGEND AND NOTES

JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: MCL
DRAWN BY: JKS

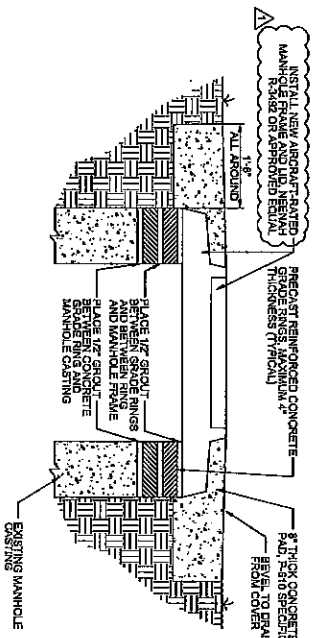
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DRAWING NUMBER
E-001

SHEET NUMBER **50**

File: U:\2017\17121501 - Ltgt - Taxiway D\04 Design\Drawings\PPT_TWD_E001_LEGEND.dwg, Last Saved: 8/2/2017 10:04 AM, Last saved by: JKitchens
Last Modified by: JKitchens, Time: 8/2/2017 10:03 AM, Plotted by: JKitchens, Plot Time: 8/2/2017 10:03 AM, Plotted using: \\jfwfs01\data\Projects\Garver Standard Files\Plot Styles\Garver Standard Full Color.ctb, Plot Scale: 1:1

File: I:\2017\17121501 - bpl - taxiway d pkg design\Drawings\BPT_TWD_E305_05.dwg Last Save: 8/2/2017 10:08 AM Last saved by: JKSchmitt
Last plotted by: Schmitt, James K. Plot Style: Garver Standard Half.ctb Plot Scale: 1:2 Plot Date: 8/2/2017 10:08 AM Plotter used: \\plywdc02\Canon IR C4080 PS



1 E-305 MANHOLE ELEVATION ADJUSTMENT
SCALE: NONE

ADJUSTMENT NOTES:

1. COORDINATE GRADE RING THICKNESS TO MATCH THE NEW FINAL GRADE.
2. COORDINATE GRADE RING SIZES TO MATCH EXISTING MANHOLE SIZES.

GARVER

REGISTRATION NO. F-5713

MATTHEW C. LOMAX 113259 LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/02/2017

REV.	DATE	DESCRIPTION	BY
1	08/02/17	ADDENDUM NO. 2	MCL

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

ELECTRICAL DETAILS V

JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: MCL
DRAWN BY: JKS

DRAWING NUMBER
E-305

SHEET NUMBER
59

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel*. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 MANHOLE ELEVATION ADJUSTMENTS. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall ~~reinstall the manhole top section or ring and cover on top~~ *install a new manhole frame and lid as shown on the plans* and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding

- All Required Connections
- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	Adjust Manhole to New Grade – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-120-1	SITE PREPARATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$	$
	Unit price in words: _____ dollars and _____ /100				

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$	$
	Unit price in words: _____ dollars and _____ /100				

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$	$
	Unit price in words: _____ dollars and _____ /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-2	LIME	TON	600	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$	$
	Unit price in words: _____ dollars and _____ /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$	$
	Unit price in words: _____ dollars and _____ /100				
T-904-1	SODDING	S.Y.	1,405	$	$
	Unit price in words: _____ dollars and _____ /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$	$
	Unit price in words: _____ dollars and _____ /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$	$
	Unit price in words: _____ dollars and _____ /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: _____ dollars and _____ /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700		

JACK BROOKS REGIONAL AIRPORT
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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				

TOTAL (BASE BID) $_____

Total price in words: _____ dollars and _____ /100

FAA-C-1391d
September 2014
SUPERSEDING
FAA-C-1391c
May 2012

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

INSTALLATION, TERMINATION, SPLICING, AND TRANSIENT/SURGE PROTECTION OF UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM POWER CABLES

This specification is approved for use by all Departments of the Federal Aviation Administration (FAA)

FOREWORD

1. This specification provides requirements for the installation of FAA-owned and maintained underground electrical line distribution (ELD) systems in support of FAA facilities. The ELD systems include power cable and associated components on the exterior, commercial power supply side of the circuit at the airfield or remote site through to the service entrance power panels of FAA facilities.

2. This specification applies only to FAA medium-voltage (MV) and low-voltage (LV) underground power cables, and to a limited extent to overhead lines that may form a part of an FAA-owned circuit. It does not apply to control, telecommunication, or facility service entrance (load side) wiring. For standards pertaining to these non-power cable and electrical systems, consult the appropriate office of primary responsibility for applicable standards.

3. Power for airfield lighting cables has a separate set of standards and procedures. Refer to the appropriate FAA Advisory Circular (AC) 150/5340 and associated governing standards.

4. This is an update to an existing specification. It assimilates recent utility industry knowledge concerning ELD systems, with the aim of providing safer, more reliable FAA underground MV and LV ELD systems.

5. Changes in this version of the document include (see change history, page iv):

   a. Revised from "c" version to "d" version.
   b. Miscellaneous updates collected from field comments.
   c. Submittals section updated; submittals matrix added as an appendix.
   d. Duct joining processes added, with special consideration of joining HDPE sections (see also appendix for sample bonding adhesives data sheet).
   e. Product section updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings, etc).

6. This specification is intended to ensure that minimum FAA requirements are met based on current commercial practices relating to safety, reliability, and restorability of FAA electrical line distribution systems. Contractors are encouraged to provide innovative, best-value solutions wherever possible within the bounds of these requirements.

Comments, suggestions, or questions on this document should be addressed to: Federal Aviation Administration, AJW-22, Power Services Group, Power Cable Program, 800 Independence Ave., S.W., Washington, DC 20591, https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/atc_facilities/power_services/power_cable/

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10/30/14
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Change History

1. Originator Name and Address AJW-22, Power Services Group	2. [] Proposed	3. Code Identification	4. Document No. FAA-C-1391c
Washington, DC	[X] Approved	5. Code Identification	6. DCN No.
7. System Designation	8. Related ECR/NCP No. ATO0W-CABLE-1023	9. Contract No.	10. Contractual Activity N/A
11. Product Integration Plan		12. Effectivity	

This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with non-listed pages of the original issue of the revision shown in block 4, constitute the current version of this specification.

13. DCN No.	14. Pages changed	S*	A/D*	15. Date
	Summary - general: a. Deletion of requirements for non-electrical-line-distribution (non-ELD) systems, including communications and telecommunications cables (both copper and FOTS), control cables, and constant-current-regulated runway approach and edge lighting power cables. Basic separation requirements between ELD and non-ELD cables have been retained. Installation standards and specifications for the non ELD systems may be found by consulting the appropriate office of primary responsibility. b. Emphasis on product changes in FAA ELD systems from the older 2.4 kV to 4.16 kV distribution circuits to the newer industry standard medium voltage systems, e.g., 3-phase/7200 V (phase to neutral). The Power Cable Program favors 15 kV rated cables and equipment to bring FAA ELD systems up to compatibility with the utility industry and to meet future FAA needs. c. Increased attention to the protection of sensitive internal constituent parts of MV cable systems during installation, by (1) the imposition of stringent tests meeting IEEE criteria, and (2) using proper cable pulling, splicing, and terminating techniques. d. Addition of power cable acceptance testing process for newly installed cables (text main body and Appendix C). Acceptance tests classified as destructive by the IEEE, such as the DC high potential (HIPOT) test, shall no longer be performed on in-service power cables. e. Treatment of the qualifications of MV "qualified persons" during installations.			1/24/2012
	Details – changes: a. Non ELD systems, deletions from FAA-C-1391b version: pp. 1-4, 7-15, 17-19. Sections/paragraphs affected: 2.1.2, 2.1.3, 3.1.2, 3.2.1, 3.2.2, 3.4, 3.4.1.1, 3.4.1.2, 3.4.2.2, Table I, 3.4.3, 3.4.3.1, 3.4.4, 3.4.5, 3.5.1, 3.5.2, 3.6, 4.2, 4.3, 4.5, 4.5.1, 4.5.2, 4.6, 4.6.1, 4.6.2, 4.6.3, App A.			1/24/2012
	Details – changes: b. Product changes, additions in FAA-C-1391c: cable 3.3.6.2; 15 kV surge protection 5.8.2; 15 kV splice kits 5.9.			1/24/2012
	Details – changes: c. Installation of cables, additions in FAA-C-1391c: splice procedures 5.9; cable pulling 5.5.12 and App B; cable end sealing 5.5.11; installer qualifications 3.3.3.2; 50/60 Hz offline partial discharge test 3.3.6.3, 3.3.6.4.			1/24/2012
	Details – changes: d. Acceptance testing procedures, additions in FAA-C-1391c: 3.3.6; Appendix C.			1/24/2012
	Details – changes: e. Qualified persons and contractors, change in FAA-C-1391c: 3.3.3 (all), 3.3.6.4, 5.9.			1/24/2012
	Updated document from "c" version to "d" version.			4/4/2014
	Miscellaneous updates collected from field comments.			4/4/2014
	Submittals updated, products updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings).			4/4/2014
	Manhole cover wheel loading and guard wire grounding upgraded.			8/15/14

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1. SCOPE

This specification defines the minimum requirements for the installation of medium voltage and low voltage (600 V) electrical line distribution (ELD) power cables buried directly in the earth or installed in underground duct or conduit. The industry definition of medium voltage is between 600 V and 34,500 V nominal voltage line to ground. The work includes surveying, trenching, and backfilling, installation of cables, conduits, concrete-encased ducts, hand holes, manholes, duct markers, joints and splicing, terminating, providing surge protection, and testing of cables for acceptability of the finished ELD. In addition, this specification defines the responsibilities of the contractor with respect to safety, quality assurance, and quality control during the installation and testing of ELD systems.

This specification covers installation and acceptance testing of FAA ELD systems only. For FAA power cable maintenance directives, refer to FAA Order 6950.22.

This specification applies to installation of medium and low voltage facility electrical supply power cables and associated equipment only. These systems provide facility power from the power supplier's primary service to the service entrance power panels of FAA facilities. For detailed information on the installation of non-ELD cable systems such as control cables, fiber optics telecommunication (FOTS) cables, communication cables, etc., consult with the office of primary responsibility (OPR) for guidance. The 2400-V shielded constant current power cables serving runway edge lighting fixtures have their own standards and are not the subject of this specification. Consult the appropriate office of primary responsibility and the airport circulars for guidance. For basic separation requirements of FAA utility power cable systems from non-electrical-power cable systems, consult the section of this specification entitled, "Separation of Cables" (5.5.10). When physically integrating non-ELD cables with power cables, do not assume all of the provisions of FAA-C-1391 apply without first coordinating with the appropriate OPR and the FAA onsite project engineer responsible for integration of multiple cable assets.

Non-ELD OPRs consist of:

a. **AJW-45 Ground-Based Navaids Group,**
b. **AJW-46 Lighting Systems Group,**
c. **AJW-52 Communications Systems Engineering Group,**
d. **AJW-53 Telecommunication Services Group,**
e. **AJW-55 Air-Ground Data Communications Group,**
f. **AJW-56 Air-Ground Voice Communications Group,**
g. **Others (as applicable).**

2. APPLICABLE DOCUMENTS

2.1 General

Due to the continuous updating of Government documents, the FAA Contracting Officer and/or the FAA Project Engineer must specify the document version and publication date current at the time of contract award or project design. The documents below form a part of this specification. Some of the FAA documents listed are out of date but are still applicable; reference the notations next to each reference provided. FAA tailoring organizations should consult with the offices of primary responsibility to obtain the most recent applicable documentation.

2.2 Order of precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Government documents

The following citations are government documents that are used as references in this specification.

2.3.1 FAA orders, standards, specifications, and handbooks

The following FAA orders, standards, specifications, and handbooks form a part of this document to the extent specified herein. Unless otherwise stated, requirements contained in these documents are as cited in the project solicitation or contract. (Copies of FAA orders, standards, specifications, handbooks, drawings, and other applicable FAA documents may be obtained from the Contracting Officer issuing the invitation-for-bids or request-for-proposals. Requests should fully identify the material desired; for example: specification, standard, amendment, drawing numbers [drawings possessing standard FAA signature block], and dates. Requests should cite the invitation for bids, request for proposals, the contract involved, or other source of the requested material.)

2.3.1.1. ORDERS

JO 3900.XX	Air Traffic Organization Electrical Safety Program [Future]
JO 6750.16	Siting Criteria for Instrument Landing Systems
JO 6950.27	Short Circuit Analysis and Protective Device Coordination Study [contact PSG Systems Engineering for arc flash calculations]

2.3.1.2 STANDARDS

FAA-STD-XXX	Underground Electric Line Distribution (ELD) Systems [Future]
FAA-STD-019	Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities

2.3.1.3 ADVISORY CIRCULARS AND SPECIFICATIONS

150/5300-13	Airport Design
150/5320	Surface Drainage Design
150/5370	FAA Standards for Specifying Construction of Airports
FAA-E-113	Poles, Wood, Treated
FAA-E-2793	Cable, Electrical Power, 2,000 to 35,000 Volts
FAA-E-2013	Cable, Electrical Power, Exterior 600 Volts

2.3.1.4 HANDBOOKS

FAA-HDBK-XXX	Underground Electric Line Distribution (ELD) Systems [Future]

2.3.2 Other Government documents, drawings, and publications

The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American Association of State Highway & Transportation Officials Specifications

AASHTO HB-17	Standard Specifications for Highway Bridges.
AASHTO HS-20	Standard Specifications for Highway Bridges

Occupational Safety and Health Administration Codes

Part 1926	Safety and Health Regulations for Construction.

Military Specifications

MIL-I-3825	Insulating Tape, Self-Fusing
DLA A-A-50563	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
DLA A-A-59213	Splice Connectors
DLA A-A-59214	Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated with Corrosion-Resistant Finish)
DLA A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
DLA A-A-59551	Wire, Electrical, Copper (Uninsulated)
Navy A-A-59827	Topside Conduit (Flexible) and Conduit fittings, Electrical: Composite Based (Non-metallic)
UFC 3-350-03FA	Electrical Power Supply and Distribution
UFC 3-600-01	Fire Protection Engineering for Facilities
UFGS 26 12 19.20	Single-Phase Transformers
UFGS 26 12 19.10	Three-Phase Transformers
UFGS 33 70 02.00 10	Electrical Distribution System, Underground

Federal Specifications

W-C-375/3	Circuit Breakers, Molded Case; Branch Circuit and Service
W-S-865	Switch, Box (Enclosed), Surface Mounted
WW-C-566	Conduit, Metal, Flexible
WW-C-581	Class 1 Type A with Standard for Electrical Rigid Metal Conduit - Steel, UL 6

2.4 Non-Government publications

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American National Standards Institute (ANSI) Standards

ANSI 6	Standard for Rigid Metal Conduit. (Same as UL 6)
ANSI 467	Standard for Grounding and Bonding Equipment. (Same as UL 467)
ANSI 514	Fittings for Cable and Conduit. (Same as UL 514)
ANSI 651	Schedule 40 and 80 Rigid PVC Conduit. (Same as UL 651)
ANSI A14.3	Safety Code for Fixed Ladders
ANSI C2	National Electrical Safety Code (NESC). (Same as IEEE C2)
ANSI C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV). (Same as IEEE C62.11)
ANSI C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits. (Same as IEEE C62.22)
ANSI C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems (Same as IEEE 1299/C62.22.1)
ANSI C62.41	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits. (Same as IEEE C62.41)
ANSI C80	Rigid Steel Conduit – Zinc Coated. (Same as NEMA C80)
ANSI C119.1	Sealed Insulated Underground Connector System Rated 600 Volts. (Same as NEMA C119.1)
ANSI FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies. (Same as NEMA FB1)
ANSI RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit. (Same as NEMA RN 1)
ANSI S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV (Same as ICEA S-97-682-2007)

ANSI TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation. (Same as NEMA TC 6 & 8)
ANSI Z535	Safety Alerting Standards. (Same as NEMA Z535)

American Society of Civil Engineers Standards

CI/ASCE 38-02	Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

American Society for Testing & Materials (ASTM) Standards

ASTM A48	Standard Specification for Gray Iron Castings.
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors
ASTM C267-97	Standard Test Methods for Chemical Resistance of Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C478	Standard specification for Precast Concrete Manhole Section (AASHTO No. M199)
ASTM C579-96	Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C580-93	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM C990	Standard Specification for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1056	Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D2444-93	Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM F512	Standard Specification for Smooth-wall PVC Conduit and Fittings for Underground Installation
ASTM 1962	Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles
ASTM F2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit

Institute of Electrical and Electronics Engineers (IEEE) Standards

IEEE C2	National Electrical Safety Code (NESC)
IEEE-48	Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE-100	The Authoritative Dictionary of IEEE Standards Terms
IEEE-386	Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600V
IEEE-400.2	IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE-400.3	Guide for Partial Discharge Testing of Shielded Power Cables in a Field Environment
IEEE-404	Standard for Power Cable Joints
IEEE-525	Cable Systems in Substations
IEEE-835	Power Cable Ampacity Tables
IEEE C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).

IEEE C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits
IEEE 1299/C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems
IEEE C62.41 (Formerly IEEE 587)	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits

Insulated Cable Engineers Association (IECA) Standards

ICEA S-94-964	Concentric Neutral Cables Rated 5-46 kV
ICEA S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV

International Electrotechnical Commission (IEC) Standards

IEC 60071-2	Insulation coordination Part 2: application guide.

National Electric Manufacturers Association (NEMA) Standards

RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit
FB1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
TC 2	Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 AND EPC-80)
TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation
TC 7	Smooth-Wall Coilable Electrical Polyethylene Conduit
TC 9	Fittings for PVC Plastic Utilities Duct for Underground Installation
TC 14	Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
NECA/NEMA 605	Recommended Practice for Installing Underground Nonmetallic Utility Duct

Underwriters' Laboratories (UL) Inc. Standards

UL 6	Standard for Rigid Metal Conduit
UL 467	Standard for Grounding and Bonding Equipment
UL 514	Fittings for Cable and Conduit
UL 651	Schedule 40 and 80 Rigid PVC Conduit

National Fire Protection Association (NFPA) Standards

NFPA-70	National Electric Code (NEC)
NFPA-70E	Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems
NEC Hdbk	Art. 110.16, Flash Protection
NEC Hdbk	Art. 344.10, Rigid Metal Conduit: Type RMC
NEC Hdbk	Art. 280, Surge Arrestors, Over 1 kV

3. GENERAL

3.1 Definitions

Unless otherwise specified, electrical and electronics terms used in this specification, and on the drawings, shall be as defined in IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*.

In the text of this specification, the words "conduit" and "duct" are sometimes used interchangeably and have the same meaning.

In the text of this specification, "medium voltage cable splices" and "medium voltage cable joints" are used interchangeably and have the same meaning.

For the purposes of this specification, "FAA electrical line distribution systems (ELD)" shall be defined as:

FAA owned and operated electrical power distribution systems (underground or overhead) running from a power source to FAA facility load(s). An ELD may include some or all of the following: power cable; transformers; sectionalizers; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Intra-facility wiring, runway edge lighting cables, and FOTS and system cables, such as MALSR or ALSF loop cables are not included as part of ELD.

The demarcation point between an FAA ELD system and FAA facility premises wiring on an airport can be ambiguous. When in doubt, consult AJW-22, Power Services Group, Power Cable Program.

3.2 Submittals

Submittals are limited to those necessary for quality control (see Appendix E). Submittals marked A are required. For submittals marked B or C, the FAA task or contract specifier shall evaluate the contract for each kind, voltage, or type of submittal used on the project and make a determination as to whether the submittal is required. Examples given are not limited to those shown in parentheses:

"A" indicates that the submittal is required.

"B" indicates that the submittal is required, unless specifically deleted by the contract specifier.

"C" indicates that a submittal is not generally required because it is expensive and/or time consuming (i.e., a special case). If the submittal is required, the contract specifier shall show the required submittal on the submittals matrix (Appendix E) and in the contract documents (as a CLIN item).

a. Contractor-generated design data (ANSI C2 and FAA-STD-032, Para 3.1.13)
   1. Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2) [A]
   2. Design assumptions and parameters (FAA-STD-032) [B]
   3. Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc) [C]
   4. Design calculations (FAA-STD-032) [A]
   5. Contractor-generated design drawings or sketches. [A]
b. Cost estimates [A]
c. Medium voltage cable [A]
d. Medium voltage cable splices and joints* [A]
e. Medium voltage cable terminations* [A]
f. Conduits [A]
g. Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc) [A]
h. Switch pads and sectionalizers [A]
i. Transfer switches (automatic and manual) [A]
j. Transformers [A]
k. Surge arresters [A]
l. Live end caps or protective caps [A]
m. Precast concrete structures [A]
n. Sealing Material [B]
o. Manhole frames and covers [A]
p. Hand hole frames and covers [A]
q. Cable supports (racks, arms and insulators) [A]
r. Protective devices and coordination study [A]
s. As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system. [A]
t. Electrical equipment factory test reports [A]
   1. Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13). [A]
   2. Transformers [A]
   3. Switchgear, sectionalizers [A]
   4. Disconnects [A]
   5. Other applicable components [B]
u. Field acceptance checks and tests (see Appendix C) [A]
v. Arc-proofing test for cable fireproofing tape [C]
w. Cable installation plan and procedure (use cable installation plan only when pulling cable between manholes; do not use for pulling from pole riser to manhole only):
   1. Site layout drawing with cable pulls numerically identified [B]
   2. A list of equipment used, with calibration certifications [A]
   3. The manufacturer, type, and quantity of lubricant used on pull [B]
   4. The cable manufacturer and type of cable [A]
   5. The dates of cable pulls, time of day, and ambient temperature [C]
   6. The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table cable pulls may be submitted. [A]

7. The actual cable pulling tensions encountered during pull [A]
8. Certificates (tensiometer calibration, VLF tester calibration, etc) [A]

x. Cable splicer/terminator qualifications* [A]
y. Cable installer qualifications* [A]
z. Project design drawings [A]

*Note: The contractor shall provide the product drawings showing details of the connecting methods to be used, and a statement of the experience of the contractor in making connections on underground systems with the proposed product. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable. Products shall meet the latest editions of applicable standards as follows:

APPLICATION STANDARD (USE LATEST ISSUED)	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

3.3 Quality assurance

All work shall comply with the National Electrical Code (NEC) and IEEE C2/National Electrical Safety Code (NESC) for components and installation. To the maximum extent practicable, furnish products that are listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environment in which the products are installed. Use of nonlisted components will not be allowed unless (1) it is demonstrated that listed components are not available, and (2) the FAA preapproves such components before installation. Approval shall be at the discretion of the FAA.

3.3.1 Quality plan

The contractor shall submit a Quality Plan in compliance with ISO 9001, *Quality Management Systems Requirements*. This plan will allow the FAA to identify the stages at which the FAA requires carrying out an inspection or witnessing a test. The plan shall cover all relevant stages of personnel qualification, design, coordination, supplier selection, manufacturers' acceptance testing, site inspection, site quality control testing, and commissioning. The plan shall identify relevant suppliers by name, components supplied, country of origin, and whether suppliers and supplied components are quality assurance certified.

3.3.2 Quality control

The quality of the equipment installed shall be controlled at the manufacturers' plants and at the project site to ensure that it meets the required specifications. The quality of civil engineering work, such as trenching, ducting, and other operations, shall be inspected by the FAA and approved after each major construction step. The contractor shall inform the FAA of manufacturing/shipping schedules and shall offer representatives of the FAA the opportunity to witness acceptance tests. These tests shall be performed on a statistically meaningful number of samples, as specified by FAA engineers. After receipt of equipment shipment and prior to

installation, the contractor shall subject equipment to a thorough visual inspection. An FAA representative shall be notified in advance and afforded the opportunity to be present and witness this step. Nameplates and markers shall be checked against the required specifications, and deviations brought to the FAA's attention. At the FAA's request, quality control checks, including acceptable electrical measurements (such as cable insulation resistance tests and surge protection leakage current measurements) shall be performed and reported. After the installation of cable systems is completed, acceptance/commissioning tests shall be performed.

All equipment and materials shall be subject to acceptance through the manufacturers' certification of compliance with applicable requirements when so requested. The requirements of this standard shall be considered as minimum requirements and shall not relieve the contractor of the responsibility to furnish and install higher grades of materials than specified when so required by the contract drawings and specifications. The installation shall conform to the most stringent requirements of the National Electrical Code (NEC), the local electrical codes, NFPA-70E, and applicable ANSI and IEEE standards, e.g., the National Electrical Safety Code (NESC), as well as other relevant guides and standards as listed in Section 2.

3.3.3 Qualifications of personnel

3.3.3.1 Designers

The design team shall have at least one engineer with significant experience in medium voltage design, review, and construction management. The engineer shall have worked with electrical power systems, and shall have designed electrical distribution systems whose reliability, maintainability, availability, and fault tolerance are of a similarly high level to those found in campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities. The design engineer shall have the ultimate responsibility for the construction set (specifications, drawings, and cost estimates) and installation quality control. Drawings and engineering documents published by a non-FAA entity shall be signed by a registered professional engineer with knowledge and qualifications tailored to underground medium-voltage and low-voltage electrical distribution systems. Drawings and engineering documents published by a non-FAA entity shall be signed as approved by FAA Engineering Services or a representative of the PSG ELD/Power Cable Program upon design acceptance. Drawings ready for release for construction shall incorporate the project's design acceptance drawings by reference.

3.3.3.2 Installation Crew

Experienced personnel regularly engaged in underground electrical distribution system work shall perform the installation. Personnel exclusively or mainly trained in overhead line work, or low voltage facility wiring work, are not sufficiently qualified to install FAA medium-voltage underground electrical distribution systems. Workers shall be properly licensed where required by law. Only qualified personnel may work on electric circuit parts or equipment being installed.

A qualified person is one who has skills and knowledge related to the construction and operation of the FAA's electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. Management personnel shall be responsible for authorizing the qualified personnel to perform a task. Besides completion of Occupational and Safety and Health

Administration (OSHA)/FAA required electrical safety training for qualified personnel, those persons authorized to work on FAA ELD systems shall meet the requirements of a Qualified Person as mandated by OSHA and as discussed in NFPA 70E.

Along with training, personnel performing medium voltage work on FAA ELDs shall have: (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, including wire and cables, (2) the skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors or parts, (3) knowledge of the safe approach boundaries, work clearances, and voltages involved, (4) familiarity with construction and operation of equipment and the hazards involved, (5) familiarity with electrical safety related work practices and precautionary techniques, (6) familiarity with proper use of personal protective equipment (PPE), arc flash, insulating and shielding materials, (7) familiarity with the proper use of insulated tools and test equipment, (8) ability to make good decisions in determining the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely, (9) familiarity with safety precautions associated with confined spaces, (10) knowledge of skills and techniques regarding how to select and use a voltage detector and phase meter, (11) familiarity with mechanical aspects of ELD installation work such as trenching, boring, excavation around existing utilities and structures, manhole rigging, and pulling cable, and (12) CPR training and basic training for emergency dispatch if an electrocution or confined spaces injury occurs.

Cable termination and splicing shall be performed only by experienced and qualified medium/high voltage electricians experienced in underground distribution systems. Before cable splices/terminations are made, the FAA may request an example splice and/or termination be made to demonstrate the electricians' qualifications. In order to qualify the splicer, this example splice and/or termination shall comply with the requirements of accessory manufacturers, and pass the requirements of IEEE standards 48, 386, and 404 with respect to partial discharge.

3.3.3.3 Inspectors and Testing Personnel

Inspectors of the FAA ELD distribution systems shall have knowledge and experience in quality control activities related to the inspection of cables laid in trenches such as are found at large campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities; shall perform quality control activities during installation and preacceptance of medium and low-voltage switchgear and sectionalizers, protective devices, power distribution transformers, surge arrestor equipment, and motor control centers; shall review functional tests of electrical equipment and conduct inspection and preacceptance of electrical drawings, termination drawings, and cable schedules; and shall interpret the various drawings used in the projects for executing and recording the work.

Test personnel shall be qualified persons meeting the requirements stipulated in Appendix C.

3.3.4 Receiving, storing, and protecting

The contractor shall receive, store, protect, and handle products according to National Electrical Contractors Association NECA 1, *Standard Practices for Good Workmanship in Electrical*

Construction, and NECA/NEMA 605, *Recommended Practice for Installing Underground Nonmetallic Utility Duct.*

3.3.5 Sequencing and scheduling

The contractor shall:

1) Notify the FAA resident engineer to schedule inspection of each duct bank or duct bank segment before concrete is placed.

2) Provide the FAA resident engineer with reasonable notification before the anticipated date of acceptance testing of the newly installed replacement ELD system so that arrangements can be coordinated with the testing contractor.

3.3.6 Cable testing

3.3.6.1 Government-furnished cable

If government-furnished power cable is delivered to the contractor, the contractor shall test the cable on the reel and report electrical or physical cable defects within two weeks of cable receipt. If adequate cable lengths are unavailable for testing on the reel, a visual inspection shall be made and damage reported to the FAA. The required tests shall then be made immediately after unreeling. Defects discovered when installing the cable shall be reported to the FAA in accordance with the contract provisions.

3.3.6.2 Contractor-furnished cable

Single and multi-conductor power cables furnished by the contractor shall conform to the FAA specifications given in the Products section of this specification.

Cable shall meet the following minimum requirements:

a. Copper conductors.

b. Thermoplastic, thermosetting, or silicon rubber insulation.

c. Neoprene, polyethylene, or vinyl jacket for normal areas, and polytetrafluoroethylene (PTFE) (Teflon®) jacket in areas exposed to fuel, oil, solvent or chemical leakage, excessive groundwater, or extremely acidic soil.

d. For cables with rated voltages to 8 kV, cable insulation shall have a minimum continuous voltage withstanding capability of four times rated voltage (but not less than 150 volts). For rated voltages above 8 kV, insulation shall have a minimum continuous voltage withstanding capability of three times rated voltage. Cable voltage surge capabilities shall be 15 times rated voltage for voltages to 8 kV, nine times rated voltage for voltages above 8 kV through 15 kV, and seven times rated voltage for voltages above 15 kV through 25 kV. Whenever a cable is covered by applicable ICEA/NEMA specifications,

the cable shall pass the test requirements for such cable. In addition, the installed cable shall satisfy after-installation acceptance tests as specified below, and in Appendix C.

e. The pull strength of the completed cable(s) shall exceed the expected installation forces by a minimum of 50 percent.

3.3.6.3 Acceptance testing of new cable

Following installation, the contractor shall perform cable testing in the presence of the FAA. The contractor shall furnish necessary test instruments except where otherwise indicated in the project plans. Only currently calibrated instruments shall be used for cable testing. A laboratory approved by the measurement instrument manufacturer shall have performed instrument calibration. When conducting FAA-authorized third-party testing, offline partial discharge testing shall constitute the final acceptance test after completion of the installation.

Testing shall be completed on contractor-installed cable before connection is made to existing cables. If warranted, the FAA will test existing cables and provide the results to the contractor through the contracting officer prior to the contractor splicing or connecting cables he has installed to existing cables.

Certain acceptance tests classified as "destructive" by the IEEE shall only be conducted on newly installed cables. Such tests shall only be conducted within the test constraints given in Appendix C. Destructive tests shall not be performed on in-service (five years or older) power cables.

3.3.6.4 Acceptance testing of new power cables above 2000 volts

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

New FAA underground, shielded, medium-voltage power cables rated 2000 volts and above shall be subjected, after installation but before connection to terminal equipment, to the following acceptance tests:

a. Continuity test for cable conductor, shield, and armor, using an ohmmeter type instrument. See FAA Order 6950.22 for parameters and test equipment.

b. Limited-voltage DC insulation resistance test using a Megger ™ type instrument. This test is formulated to apply and hold a DC voltage on the cable for a specified time, while measuring insulation resistance. See Appendix C for test description and processes.

c. One of the following tests:

a. Very low frequency (VLF, 0.1 Hz) AC high-potential withstand "pass/fail" test. The purpose of this type of test is not to ensure cable system future performance but simply to

reassure the construction team that the line is not grounded/shorted before energization. The test shall be performed after cable system installation, including terminations and joints, but before the cable system is placed in normal service. See Appendix C for test description and procedures.

b. If third-party partial discharge acceptance testing is authorized, a diagnostic 50/60 Hz, off-line partial discharge test. This test can localize and determine the severity of any defects in the new installation. Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm shall be a qualified contractor preauthorized by the FAA. See Appendix C for test description and procedures.

3.3.6.5 Acceptance testing of new power cables 600 volts and below

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

All low-voltage (≤ 600 V) power cables shall measure not less than 50 megohms resistance between conductors, and between conductors and ground (see FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Measurements shall be taken at not less than 500 volts DC and not more than 1000 volts DC. This test does not constitute proof that the system is free from insulation defects but rather supplies evidence that the insulation was not damaged during the installation process.

3.3.6.6 Failure of cable under test

If the contractor-furnished cable fails to meet test requirements after installation, the contractor shall repair or replace, at his expense, the sections of cable proven defective.

If the government-furnished cable fails to meet test requirements after installation due to contractor's faulty installation practices, the contractor shall repair or replace the defective sections of cable at contractor's expense.

The installation contractor shall be responsible for retest costs if components are found to be substandard during acceptance test(s) as a result of contractor faulty installation practices.

4. PRODUCTS

4.1 Product options and substitutions

Alternative products may be substituted for product types that do not apply to the project. Consult with the airport authority and the local FAA project engineer.

4.2 Power cable

Single and multi-conductor power cables shall conform to the following FAA specifications:

a. FAA-E-2013 for single-and multi-conductor power cables used in exterior 600 volt applications.

b. FAA-E-2793 for single and multi-conductor power cables used in exterior 2,000 to 35,000 volt applications. Reference Section 4.2 for product factory certified test result reporting requirement.

4.3 Transformers

4.3.1 High voltage transformers (>600 volts)

4.3.1.1 Transformer design

ELD transformers are normally installed outdoors with proper clearance from structures. Transformers shall be "enviro-friendly" mineral-oil-filled or biodegradable electrical insulating and cooling-liquid filled. Choose less-flammable transformer liquids unless there is a specific requirement to do otherwise.

If the local site stipulates less flammable transformer liquids, the following section shall apply, use NFPA 70 for liquids having a fire point not less than 300 degrees C tested per ASTM D92 and a dielectric strength not less than 33 kV tested per ASTM D 877. Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate. The fluid shall be a biodegradable electrical insulating and cooling liquid classified by UL and approved by FM Approvals® as "less flammable" fluids. The fluid shall meet the following properties:

- Pour point: ASTM D 97, less than -15 degree C,
- Aquatic biodegradation: EPA 712-C-98-075, 100%,
- Trout toxicity: OECD Test 203, zero mortality of EPA 600/4-90/027F, pass.

Silicon-filled and R-temp filled transformers shall not be used for less-flammable applications.

Transformers shall be pad mounted and of dead front design. If two-compartment transformers are required, obtain preapproval from the lead Engineering Services engineer or the Power Services Group, AJW-22. Aluminum core construction is acceptable. Due to associated safety hazards, transformers of the pole-mounted style shall not be used for ground-level FAA ELD applications.

4.3.1.2 Transformer bases and cabinets

Use stainless steel bases and cabinets in most applications, unless otherwise specified. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.3.1.3 Warning signs and arc flash/shock hazard labels

For the enclosures of pad-mounted transformers having a nominal rating exceeding 600 volts, provide warning signs. After completion of arc flash hazard and shock analyses, label transformers with arc flash hazard and shock hazard warning information suitable to the particular installation.

4.3.1.4 Transformer losses

Transformers should meet the efficiency standards set forth in DOD's Unified Facility Guide Specification (UFGS) 26 12 19.20, *Single Phase Transformers,* Section 2.2.3.

4.3.2 Low-voltage transformers (<600 volts)

In FAA ELD systems, dry-type distribution transformers are used for buck boost applications or for short point-to-point distances for small loads of 600 volts or less. When used indoors, refer to FAA Specification FAA-C-1217, *Electrical Work, Interior.*

Transformers shall be mounted to allow for adequate ventilation (suitable for the local ambient temperatures).

4.4 Switchgear and sectionalizers

FAA ELD systems contain two types of switchgear: switch pads and sectionalizers. Both are fused devices used to de-energize equipment to allow work to be done and to clear faults downstream. More importantly, they isolate faulted line segments from a distribution system. These units shall be dead front-type units.

- Low-profile switch pads are typically used for single-phase applications.
- Sectionalizers are typically used for three-phase applications.

- Enclosures shall be outdoor rated or stainless steel, depending on location, meeting the requirements of ANSI C57.12.28. Use steel construction for typical installations. Use stainless steel construction for corrosive/salt environments.
- Pads or vaults shall be constructed of concrete or composite concrete-glass material. Concrete is preferred, but the latter may be used if approved by the FAA Resident Engineer and included on the drawings.
- Bases and cabinets shall be constructed of materials based on geographic location. Applications in dry locations shall employ steel; in wet locations, stainless steel.
    - Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.
    - In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.5 Service disconnecting means

A main disconnect switch (MDS) ensures that electrical service to a facility can be completely de-energized for service or maintenance.

- MDSs shall be outdoor rated or stainless steel. Enclosures shall be NEMA 3R for typical applications, NEMA 4X for corrosive/salt environments.
- Pads shall be constructed of concrete or polymer concrete composite material. Concrete pads shall be no less than 6 in. thick. Concrete pads shall be brushed, chamfered, and graded for drainage. Expansion couplers should be considered in areas prone to frost heaving or ground settling.

4.6 Terminations and splices

4.6.1 Terminations

All power cable terminations rated above 4000 volts or with an outer shield shall be made with an authorized stress-relief device. Cable terminations shall be of a prefabricated design. Special care shall be exercised to provide the proper ratings and physical dimensions.

4.6.2 Splices

For medium voltage power cables (600 volts and above), use cold-shrink splice kits meeting ANSI/IEEE Std. 404 (for a 15 kV rating). For power cables 600 volts and below, use heavy-wall

self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006. Alternatively, use a poured epoxy splice, or any other splicing means approved by ANSI standards.

4.7 Overcurrent protective devices

- For FAA ELD systems, the preferred protective devices are fuses. In transformers, fuses shall be immersion-type, current-limiting fuses, accessible from the exterior of the equipment.
- The specific type and size of protective device shall be selected based on a protective device coordination study and short circuit analysis, and as provided in the drawings.

4.8 Underground duct systems

The configuration of an underground duct system shall depend on the specific application. Conduit types used within FAA duct systems shall be of the size, material, and type indicated on the contract documents. Size of conduit shall always be indicated on the drawings. All conduit material shall be UL listed and installed in accordance with UL listings.

4.8.1 Concrete-encased rigid nonmetallic conduit

Rigid nonmetallic conduit consists of two types:

1) Concrete-encased Schedule 40 PVC conduit is preferred for ELD duct systems. To reduce costs or for special applications, direct-buried Schedule 80 PVC conduit may be used in lieu of concrete encasement.

2) High-density polyethylene (HDPE) is a rigid nonmetallic conduit commonly used for boring.

4.8.1.1 PVC conduit

PVC conduit shall meet the requirements of UL651 – *Schedule 40 and 80 Rigid PVC Conduit,* NEMA TC 2 – *Electrical Polyvinyl Chloride (PVC) Conduit.* Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.1.2 HDPE conduit

HDPE conduit shall meet the requirements of ASTM F2160-10/ASTM 1962-11/NEMA TC7.

4.8.2 Plastic-coated steel conduit

4.8.2.1 PVC coated RGS

Where situations warrant, such as when runway and equipment shutdown impacts are a consideration, PVC coated RGS may be used in lieu of concrete encased PVC duct. This substitution must be annotated on the drawings. Direct-buried rigid galvanized steel shall be

plastic coated. An acceptable alternative is RMC wrapped in half-lap fashion with pressure-sensitive 10-mil PVC-based corrosion protection tape.

PVC exterior coated, urethane interior coated, galvanized rigid steel conduit shall meet the requirements of NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.2.2 Fittings and conduit bodies
Use 40 mil PVC exterior coated, urethane interior coated, zinc-plated, threaded, malleable iron meeting the requirements of UL514B – *Fittings for Conduit and Outlet Boxes,* and NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.3 Direct buried rigid nonmetallic conduit

Direct-buried conduit shall be Schedule 80 PVC.

Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.4 Rigid metal conduit (RMC)

Above-ground exterior conduit shall be rigid steel conduit.

Conduit used in exterior applications such as in an equipment rack shall meet the RGS requirements of UL6 – *Rigid Metal Electrical Conduit,* and ANSI C80.1 – *Rigid Steel Conduit, Zinc Coated.*

RMC fittings and conduit bodies shall meet the requirements of UL514B and ANSI/NEMA FB1.

Fittings: Follow NEMA TC 9, NEMA TC 14, and ASTM F-512.

4.9 Corrosion protection tape

Use pressure-sensitive, 10-mil-thick, PVC-based tape for corrosion protection of metal conduit and fittings.

4.10 Insulating bushings

Use NRTL-listed insulating bushings with 105° C rated insulation. Apply insulated protective caps to any unoccupied bushings. Dust caps shall not be used as substitutes for protective caps.

4.11 Grounding bushings

NRTL-listed, galvanized malleable iron, 150° C rated insulated throat grounding bushings with lay-in type ground cable lugs.

4.12 Sweeps

All sweeps shall be PVC-coated or tape-wrapped rigid galvanized steel (RGS).

Do not provide sweeps into a manhole. Vaults shall be considered for all transformer and switchgear applications wherever possible, eliminating the need for sweeps.

4.13 Duct spacers

Standard precast spacers ("chairs") shall be used for duct support and alignment. Duct spacers shall provide a 3-inch separation between the conduit and the ground. There shall be a minimum of 3 inches of concrete on bottom, sides, and top of duct.

4.14 Duct plugs

In unused ducts, use soft, expansible gasket material compressed with non-metallic plates and bolts to produce a positive seal against water and gas.

4.15 Duct sealant and joint filler

Use expandable foam duct sealant kits to prevent water and gas from entering manholes, vaults, or structures.

Use premolded joint filler to fill holes in and around conduit to keep rodents out of the ELD system. Use closed-cell expanded neoprene joint filler conforming to ASTM D1056 – *Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.*

4.16 Underground duct and cable warning tape

Furnish detectable underground warning tape for underground duct banks. Use aluminum-backed, 0.005 inch thick, underground warning tape with a red background color. Lettering shall be black and indicate the type service buried below:

"CAUTION BURIED ELECTRIC LINE BELOW"

Use tape width appropriate for the burial depth:

A. Three-inch wide tape for up to 18 inches depth.
B. Six-inch wide tape for up to 24 inches depth.

All direct buried cable shall be marked with extrusion-laminated underground marking tape. Tape shall be a minimum of six inches (6") wide and shall run continuously in the cable trench six inches (6") below the surface or as indicated on the project plans. Tape shall be bright red, and constructed of solid 100% pigmented plastic, and not an ink-coated plastic.

4.17 Pull wires and tape

For spare ducts, specify ¼ inch pull tape having a minimum tensile strength of 400 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc).

For ELD circuits that include raceways within vaults or other locations, raceway measuring/pulling tape may be used. Tape shall have permanently printed measurements in one-foot increments and minimum 1200 lb average breaking strength.

4.18 Precast electrical manholes and hand holes, accessories

4.18.1 Manholes and hand holes

Precast reinforced concrete electrical utility structures shall be of the size and shape as detailed on the drawings in conformance with ASTM C-858 – *Standard Specification for Underground Precast Concrete Utility Structures*. Electrical manholes are typically 4' long, 4' wide, and 4' high, or as shown on the drawings. Electrical manhole sections shall conform to ASTM C-478.

4.18.1.1 Manholes/hand hole structures, frames, and lids

4.18.1.1.1 Airports handling aircraft with maximum departure/takeoff weight of 30,000 lb and above--For airports with a design aircraft maximum departure weight of 30,000 lb and above,* manholes/hand holes, frames, and lids located within the airport runway/taxiway safety areas (RSA/TSA) shall be of the aircraft-rated type, designed and certified for 100,000 lb (45,000 kg) wheel loads with 250 psi (1.72 MPa) tire pressure. (Refer to FAA Advisory Circular 150/5320-6, Appendix 3, *Design of Structures for Heavy Airplanes*). Clearly indicate on the drawings underground utility structures that will be subject to aircraft loading. For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, those structures shall be aircraft rated.

Outside the RSA/TSA, H-20 highway-rated manhole and hand hole components are permitted, provided an adequate proof load safety margin for the casting is met. First, live loading shall meet basic H-20 loading requirements per A.A.S.H.T.O. HB-17, *Standard Specifications for Highway Bridges*. The live load shall be that loading which produces the maximum bending and shear moments in the structure. H-20 design wheel load is a minimum of 16,000 pounds, or 80 psi. For the safety margin, the casting must meet AASHTO M306, which requires that it pass a proof load test of 40,000 lb applied on a 9x9-in. pad in the center of the casting. H-20 rated utility structures that do not meet the above requirements shall not be used.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

*Airports handling dual-wheel-landing-gear aircraft up to 60,000 lb maximum departure weight are permitted to use highway-rated manholes/hand holes and components in the RSA/TSA because the wheel load is distributed over four tires (60,000 ÷ 4 = 15,000 lb). Adequate safety margins must be met through proof loading. Refer to the H-20 loading requirements specified above.

4.18.1.1.2 Airports handling aircraft maximum departure/takeoff weight of 30,000 lb or below-- For airports with a design aircraft maximum departure weight of 30,000 lb or below (60,000 lb if dual-wheel landing gear), manholes/hand holes, frames, and lids located both within and outside the airport runway/taxiway safety areas (RSA/TSA) shall be of the highway-rated type, provided a safety margin for the manhole casting is added. Live loading shall be for H-20 loading with adequate safety margin as described in Section 4.18.1.1.1 above. Clearly indicate on the drawings underground structures that will be subject to aircraft loading.

For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, and the expansion is expected to accommodate heavier aircraft with maximum departure/takeoff weight of 30,000 lb and above (60,000 lb if dual-wheel landing gear aircraft), those structures shall be aircraft rated. Concurrently, existing non-aircraft-rated manhole/hand hole structures throughout the airport's RSA/TSA areas shall be retrofitted with aircraft-rated structures and components.

Outside the RSA/TSA in non-vehicular traffic areas, other types of enclosure structures (e.g., polymer concrete, nonreinforced concrete, or other) may be used provided (1) they meet ANSI Tier 22 (design/ test = 22,500/33,750 lb) specifications, and (2) have been approved by the FAA resident engineer.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

Manhole markings--Identify electrical power manholes and hand holes by "FAA Power" markings cast in the steel cover, or so identified with a die stamped, nominal one sixteenth inch (1/16") minimum thickness copper plate, brazed or fastened to the cover with a minimum of two 10-32 brass machine screws.

4.18.2 Manholes accessories

Frame and lids--Use heavy duty cast iron manhole frame with solid lid. Lid may be spring loaded. Alternatively, lid may consist of partitioned aircraft-rated lid segments, each segment capable of being lifted separately, facilitating easier and safer access.

Racks--Cable racks and cable support arms shall be furnished in the quantities and locations indicated by the drawings for each manhole. Racks shall be made of nonmetallic material (for example, PVC, plastic, or UL-rated glass-reinforced nylon). Saddle arms shall be as per the approved project drawings. Splices and cables shall be attached to cable racks.

4.19 Grounding cables

Depending on the application, ELD exterior grounding conductors shall be of the type and size required by applicable sections of FAA-STD-019.

a. For equipment grounding conductors, use 4/0 AWG bare stranded, soft temper copper cable per ASTM B 8, *Standard Specification for Concentric-Lay Stranded Copper Conductors.*

b. For guard wire, use 1/0 AWG bare copper, stranded.

c. For bonding conductors, use No. 2 AWG bare copper, stranded.

4.20 Ground rods

Ground rods ("grounding electrodes") shall be three quarter inch (3/4") by ten foot (10') long copper or copper-clad steel.

4.21 Weather heads on risers, drip loops

Risers feeding FAA owned underground distribution systems shall have weather heads installed. Each weather head shall have drip loops that loop no less than 6" below the weather head.

4.22 Electrical equipment enclosures

Bases and cabinets of electrical equipment shall be constructed of materials suitable to their geographic location.

Typical, dry environments--For typical dry conditions, mild steel bases and enclosures may be used. These provide protection against rain, sleet, and snow in outdoor applications.

Corrosive or wet environments—For typical wet (or wet and salt-corrosive) conditions, use stainless steel bases and enclosures.

Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.23 Equipment vaults and pads

Follow the drawings for specification and construction details of equipment foundation support structures. Specific applications are as follows:

4.23.1 Concrete vaults

For low-profile single phase transformers, use precast concrete vaults to facilitate ease of transition from duct bank system to transformer termination points. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.2 Concrete pads for transformers

Foundations of poured concrete pads for larger size transformers (>50 kVA) shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.3 Concrete pads for equipment racks

Foundations of poured concrete pads shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall be chamfered, brushed, and graded for drainage. Expansion couplers on protruding conduits should be considered in areas prone to frost heaving or ground settling. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

Prefabricated concrete pads with cutouts for cables can be used where frost heave is prevalent. Arrange for lift equipment to place the pads. Install cables in conduit and leave a slack length of cable in case the pad is displaced upward by ground frost.

4.23.4 Composite polymer concrete equipment pads

If approved by the FAA Resident Engineer and included on the drawings, lightweight polymer concrete flat pads and box bases that provide sufficient strength-to-weight ratios may be used. These units have cutouts and preinstalled mounting hardware. No extra equipment is required to lift the pads into position.

Composite pads/boxes shall be composed of cement mortar reinforced by alkali resistant glass fibers. The material shall incorporate a minimum of 4 percent by volume of alkali resistant glass fibers.

Composite pads/boxes shall meet or exceed a compressive strength of 11,000 psi per ASTM C579-96, a flexural strength of 1,800 psi per ASTM C580-93, and a modus of elasticity of 2,900,000 psi per ASTM C580-93. Composite pads/boxes shall also pass chemical resistance and impact resistance tests in accordance with ASTM C267-97 and D2444-93.

Composite pads/boxes shall not warp, support flame, rust, or be UV degradable. They shall have a waffle bottom design to permit loose earth to fill bottom voids to level and stabilize the pad. The pad/box shall not be affected by asphalt, road salts, fertilizers, transformer oil, other common chemicals, weather, sunlight or other normal service conditions to which they may be exposed. Composite pads/boxes shall be capable, with equipment installed, of withstanding temperature variations of -40 degrees C (-40 degrees F) to +65 degrees C (149 degrees F) without cracking, splitting, or deforming. They shall not be designed and constructed so as to trap or hold water and shall be able to withstand repeated freeze-thaw cycles.

4.24 Bollards

Bollards shall be used only where it is necessary and/or as required by the airport authority to protect electrical equipment and enclosures from field vehicle damage or other mechanical damage. Bollard use and placement shall be as specified on the drawings or as determined by final location of equipment. Unless otherwise specified, use 4-in. diameter steel pipe filled with concrete. Bollards shall be placed 3 ft deep and extend 4 ft above ground level. Premanufactured plastic jackets shall cover each bollard.

5. EXECUTION

5.1 Scheduling of work

Airport runways must remain in operation during certain periods. Contractors shall proceed in a manner that produces minimum disruption to the FAA and airport operations. During construction activity, contractors shall coordinate work through the FAA Resident Engineer, the airport authority, air traffic control tower, airport security, and other contractors as defined by the contract documents. Work performed within the RSA/TSA of an active runway may require runway/taxiway closing. Advance notice of proposed work near an active runway shall be required to be given by contractors to the FAA.

5.2 Existing FAA buried cable and ducts

5.2.1 FAA documentation

The contract documents define the drawing format used by the FAA to record the location of buried cable and ducts. The contractor shall use the FAA format during the course of work to ensure the accurate location of the new installations as described on the FAA drawings. The contract documents shall include copies of FAA drawings for the area of work. Contract drawings and engineering documents published by a non-FAA entity shall be approved by the FAA project engineer.

5.2.2 FAA marking of known buried cables and ducts

All known FAA power and control cables leading to and from an operating facility will be marked in the area of work by the FAA for the information of the contractor before starting work. The FAA will mark these cables once for the contractor. It shall be the contractor's responsibility to maintain these markings throughout the course of the project. Airport mowers may be expected to be in use by airport personnel throughout the duration of the work, keeping markers visible. FAA is responsible for marking FAA cables ONLY. The contractor shall be responsible for marking other cables and utilities in the work areas through a third party location service.

5.2.3 Other buried cables, ducts, piping and items

Locating utilities--The contractor shall be responsible for contacting the utilities prior to starting work and for confirming the location of existing utilities and other items that may be buried in the area of work. Along an area suspected of having utilities of any sort, the contractor shall hand dig or use other authorized low-impact digging system. The airport authority shall be contacted to locate those items owned or known by the airport to exist.

Avoiding buried structures--The contractor shall take precautions to protect existing underground (buried) items including but not limited to; fuel tanks, water lines, cables, ducts, and structures.

Buried items shall be protected from damage for the duration of work. The contractor shall immediately repair, with equal material by skilled workmen, those items damaged by the contractor or subcontractor.

Procedure for making repairs during installation--Prior authorization from the FAA shall be obtained for the materials, workers, time of day or night for making repairs, method of repairs, and permanent repairs the contractor proposes to make. In the event of inadvertent damage, the contractor shall immediately stop work and notify the FAA and utility when appropriate. Repair work shall be inspected and authorized by the FAA with the concurrence of the affected utility company, airport, or other owner(s) of the damaged item(s).

Cables to be abandoned—When a DEB cable is identified to be abandoned, where possible it shall be disconnected and left in place. Unless otherwise directed, cut the cable, armor, and ground wires back 10 feet at each end. Where possible, exothermically weld the cable ends to ¾" by 10' ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

When a cable in duct is identified to be abandoned, ground the cable, armor, and ground wires at both ends. Where possible, exothermically weld the cable ends to ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

Replaced cables—Replaced cables shall trace the same routing path as previously employed. Should there be a need to divert from the previous route, careful planning shall be exercised, especially in areas where utilities, communications, control, and NAVAIDS systems such as Glide Slope and Localizer facilities are installed or planned to be installed in the future. Approval from the office of primary interest is required.

5.3 Safety during construction and testing

All necessary site work included in the overall scope of work, from delivery to site to final authorization, shall undergo a safety risk assessment. A detailed, site-specific, Safety Risk Assessment shall be submitted by the contractor to FAA for final authorization no fewer than 3 weeks prior to commencement of on-site work. During construction, installation, and testing, the contractor shall comply with the safety rules of FAA (FAA Order JO 3900.XX, FAA Advisory Circular AC 150/5370-2) and those dictated by OSHA (Part 1926), NEC, ANSI/IEEE, and ANSI C2 (the NESC). The contractor shall be responsible for the implementation of FAA-authorized items in the Safety Risk Assessment document.

5.4 Excavation and trenching

The following are general excavation and trenching requirements. Note paragraphs that follow for particular requirements for either (1) direct earth buried cables, or (2) underground duct cables.

5.4.1 Depth requirements

IEEE ANSI C2 (part of the National Electric Safety Code) specifies the minimum legal depth requirements for medium-voltage power cable during installation. Tailoring organizations shall evaluate site-specific requirements and follow the following standards in order of precedence: (1) IEEE ANSI C2, then (2) paragraphs below, then (3) local standards if applicable.

Conduits shall meet the following minimum standards:

a. Unless otherwise specified due to soil conditions or other circumstances, cables, conduits, and ducts shall be buried to the minimum depth to their top as specified by the following paragraphs b through g. In the event that achieving the minimum depth is not feasible, follow the direction of the FAA Resident Engineer.

b. Top of direct-earth buried (DEB) conduit or cables under 600V shall be a minimum of twenty four inches (24") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

TABLE I. Burial depths (source: ANSI C2)

Voltage (phase to phase)	Depth of burial	
	(mm)	(in.)
0 to 600	600	24
601 to 50,000	750	30

c. Top of direct-earth-buried conduit or cables over 600V shall be a minimum of thirty inches (30") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

d. If finished grade has not been established before the cable trenches are excavated, it is the contractor's responsibility to determine what the final finished grade elevation will be and excavate the trench deep enough to meet the depth requirements at the end of the project.

e. Underground concrete-encased duct, and duct consisting of PVC Schedule 80, HDPE, or RGS conduit, shall be installed so that the top of the conduit is buried at not less than twenty-four inches (24") below finished grade.

f. Additional requirements for all ducts: concrete-encased duct, rigid steel conduit, or PVC conduit shall be installed so that the top of the conduit is buried as follows:

1. When installed under runways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

2. When installed under taxiways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

3. When installed under other paved areas, in accordance with Table I or as required by the local jurisdiction.

4. For railroads and state-owned highways, at the minimum depth below grade as specified by those entities.

5. Where local conditions require unusually deep burial of ducts, contractor shall discuss the situation with the FAA project engineer and obtain preauthorization.

g. In northern climates where deep trenching is cost prohibitive, use a standard depth of not less than 24 inches (24") from top of duct, cable, or conduit to finished grade.

h. Cables shall not be direct buried under paved areas, runways, taxiways, roadways, railroad tracks, or ditches. Where cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in rigid steel conduit, concrete-encased PVC, steel conduit, or high-density polyethylene (HDPE) conduit, as defined by the contract documents. Where cables cross under railroad tracks, such cables shall be installed in accordance with the requirements of the railroad authority. Cables under railroad grades may be installed in reinforced concrete-encased ducts, rigid galvanized steel sleeves, or HDPE conduit, subject to the requirements of the railroad authority. HDPE must be of sufficient crush strength to withstand expected static and dynamic loads over the expected lifetime of the cable without deformation. For directional boring under railroad and roadway grades, standard dimension ratio (SDR) 11 or 9 shall be used depending on conditions and conduit diameter. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness. Damage to conduit coatings shall be prevented by providing ferrous pipe jackets or by predrilling. Ducts shall extend at least 1 foot beyond each edge of paving and at least 5 feet beyond each side of railroad tracks.

i. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering. Cables may be pulled into duct from a fixed reel where properly sized rollers are provided in the trench. Where cuts are made in paving, the paving and subbase shall be restored to their original condition. Where cable is placed in duct (for example, under paved areas, roads, or railroads), ducts shall be made to slope in order to drain.

5.4.2 Survey requirements

5.4.2.1 Recording of data

The ELD project record shall consist of (a) information entered in computer-aided design and drafting (CADD) systems, (b) manual plotting onto the FAA drawing set, (c) Global Positioning System (GPS) data, (d) Geographic Information System (GIS) information or databases, and/or (e) other appropriate documentation as set forth in the contract documents.

Placement of markers--Drawings shall record positions of markers placed in or on top of direct earth buried (DEB) power cable trenches, and at duct bank manholes and hand holes. The markers shall be identified on the drawings by a small circle with a "P" in the center for power cable, "C" for control/fiber cable, "R" for coaxial cable, "S" for special purpose points, and "T" for telecommunications.

DEB cable--DEB cable trenches shall be identified on the drawings with text boxes pointing to the trench indicating what is in the trench. If there are several cables in the trench, each cable shall be called out. Power cables shall be identified by the actual working voltage of the cable and not by the cable insulation rating. Anything unusual, peculiar, or unique about the cable runs shall also be called out in the drawings.

Duct banks--Duct banks shall be plotted on the drawings. Duct banks that are installed for future use shall have text boxes pointing to them indicating that they are future-use duct banks. In the case of a duct bank where the duct bank is not a straight line between the manholes or hand holes, enough markers of the type specified herein shall be installed to accurately depict the routing of the duct bank.

Manholes, hand holes, and splices--Manholes shall be identified on drawings by a small square with an "MH" in the center. Hand holes shall be identified by a small square with an "HH" in the center. Where manhole and hand hole numbers are provided on the contract drawings, they shall also be called out on the completed cable drawing. Splices made in manholes and hand holes shall be shown on the cable drawings.

Abandoned cables--The contractor shall provide data on the types and locations of abandoned cables in places where they affect the excavation of new trenching, such as at points of intersection with other structures, including runways, taxiways, concrete pads, utility pathways, roads, etc. This information shall be included on the drawings.

5.4.2.2 Survey points

The contractor shall record the survey point of each manhole using GPS coordinates. At each major change of direction of the cable circuit, a manhole shall be present and its location surveyed and recorded. Surveying and data gathering for this purpose shall be completed before a trench or structure is backfilled.

If for some reason the cable path deviates from a straight line between manholes and is not capable of being traced using tracing equipment, the deviation should be recorded as a survey point on the drawings for future reference. Where the cable terminates to a building, a transformer, an antenna, a light bar, an outside demarcation cabinet, switch rack, or other similar device, the survey shall include the four corners of the device or facility where it terminates. A tolerance of plus or minus five inches (± 5") will be acceptable for describing the cable path.

Special-purpose points--Special-purpose points may be used to indicate points such as splices or entrances to duct banks in records and on the drawings. Special-purpose points shall be accompanied by a text box to describe the function of the specific point.

5.5 Underground duct systems

Power distribution cables at FAA installations shall be installed in underground duct systems. Unless preauthorized per the drawing set and construction specifications, direct earth burial (DEB) of power distribution cables is prohibited. If preauthorized, any DEB construction shall meet the requirements in Section 5.6.

5.5.1 Preparation and excavation for underground ducts

In preparing to install underground ELD ducts, contractor shall meet the industry standards given in this section. Contractor shall also work with FAA to contact the owner for their requirements, coordinating underground ELD duct work to avoid interference with other airport projects and existing utilities. The contract specifier shall work with the Power Cable (ELD) Program Office to ensure coordination of work with other FAA programs that may have an interest in using the same duct system or trench.

The contractor shall excavate trenches for underground ducts as follows:

a. To the depth specified in paragraph 5.4.1c.

b. Install underground duct bank systems according to the NEC, the NESC, NECA/NEMA 605 (*Recommended Practice for installing Underground Nonmetallic Utility Duct)*, ANSI/IEEE C2, and other requirements in this section.

c. Verify routing and termination locations of duct banks before excavation for rough-in.

d. Verify that field measurements are as shown on the drawings.

e. Position trench so concrete envelope of duct banks shall have the following minimum horizontal and vertical separations from parallel or perpendicular runs of other utility pipes or conduits (Table II). Note: Measurements are guides only; check with local authorities and the owner for their specific requirements.

f. Make trenches of sufficient width to receive work to be installed and provide specified concrete coverage on sides.

g. Conduit or castings required under roadways or railroads shall be installed by boring. Jacking of conduit is not allowed. Conduits bored under roads off airport property shall be a minimum of thirty inches (30") below finished grade, or as required by the local jurisdiction.

h. Backfill excavations for duct banks and manholes in 6-inch layers using excavated soil. Remove roots, rocks and sharp objects. Furnish coarse sand as required for additional backfill material.

i. Moisture condition backfill soil and compact to 95% of maximum density under paved areas and 90% of maximum density under unpaved areas.

j. Overfill excavations to allow for settling.

k. Firmly tamp backfill in the separation area.

l. Restore area.

TABLE II. Spacing of power cable ducts from other utilities.

UTILITY TYPE	PARALLEL LINES	PERPENDICULAR CROSSINGS
Water	36 inches horizontal separation	24 inches
Gravity Sewer	36 inches horizontal separation	24 inches
Force Main Sewer	36 inches horizontal separation	24 inches
Storm Drain	36 inches horizontal separation	24 inches
Natural Gas	60 inches horizontal separation	24 inches
Steam or Hot Water	60 inches horizontal separation	24 inches
Open Communications	24 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete
Secure Communications	36 inches horizontal separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.	24 inches vertical separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.
Electrical	12 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete

5.5.1.1 Connecting requirements for HDPE conduit running through and emerging from a bore

When placing HDPE conduit underground through a bore, use one continuous length of flexible HDPE conduit. In instances where a continuous run of conduit is not possible, individual sections shall be joined using heat-welded (fused) connections. After emerging from a bore, the HDPE will typically terminate in a manhole at both ends.

To join lengths of conduit together after emergence from a bore, follow these procedures:

a. If the emerging HDPE conduit is to be joined to PVC conduit, the HDPE conduit section shall be run into the bell end of the PVC conduit and cemented using a special bonding agent (Table III) (see Appendix F for a sample two-part bonding product). Adhesives typically used for connecting PVC segments are not of sufficient strength for HDPE-to-PVC transitions and shall not be used. Alternatively, the HDPE conduit may be connected to a PVC coupling on the end of a length of PVC conduit. The point of

transition shall then either be (1) encased in concrete together with the remaining run of PVC, or (2) direct earth buried, depending on the type of burial method used for the rest of the run.

b. Connection details involving HDPE conduit shall be shown on the drawings.

TABLE III. Adhesive minimum pullout-force requirements for bonding HDPE to HDPE and HDPE to PVC conduit materials.

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ⅛ inch	760 lb
1 ½ inch	2 ⅜ inch	1,140 lb
2 inch	2 ½ inch	1,520 lb
4 inch	3 ¾ inch	4,560 lb

5.5.2 Backfilling

Backfilling material and procedures depend on the design used, whether concrete-encased duct or direct buried conduit. Consult FAA Advisory Circular AC 150/5370-10 for construction details.

Trenches shall be completely backfilled and tamped level with the adjacent surface. When necessary to obtain the desired compaction, backfill material shall be moistened or aerated. When sod is to be placed over a trench, backfill shall be stopped at a depth equal to the thickness of the sod to be used. Excess excavated material shall be removed in accordance with the contract documents.

5.5.3 Restoration

Restoration shall be in accordance with local airport authority requirements, or as otherwise stated in the contract statement of work. Where it has been removed, soil shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable laying, pad construction, and other work shall be restored to the original condition.

Restoration shall include the necessary grading, seeding, sodding, sprigging, or hydroseeding as required to restore the disturbed area to match the adjacent area. Where trenching cuts through paved areas, the surface shall be properly backfilled and resurfaced with paving similar to the original paving or concrete as the drawings specify.

Resurfaced areas shall be level with original paving, free from cracks, and capable of withstanding full traffic loads without settling or cracking. The contractor shall be held responsible for maintaining all disturbed and restored surfaces until final acceptance by the FAA.

5.5.4 Duct installation

Cable duct banks shall be installed outside of the airport runway/taxiway service areas (RSA/TSA), as well as ILS critical areas, to the greatest extent possible. Where trenching is required through an RSA or TSA area, place the manholes to the farthest extent possible outside the RSA and TSA while still maintaining standard spacing and directional change requirements as noted elsewhere in this specification. For locations of RSA/TSA/ILS areas, consult with the FAA Resident Engineer. (See also FAA Order JO 6750.16, *Siting Criteria for Instrument Landing Systems*, and FAA Advisory Circular 150/5300-13, *Airport Design*, particularly Chapter 6, *Navigation Aids [NAVAIDs] and On-Airport Air Traffic Control Facilities [ATC-F]*).

When there is an immediate change in direction of a duct system, a manhole or hand hole shall be installed. Any gradual change in direction (e.g., a gradual arc of the duct) shall require the approval of the resident engineer prior to installation.

5.5.5 Manhole and hand hole installation

5.5.5.1 Manhole installation

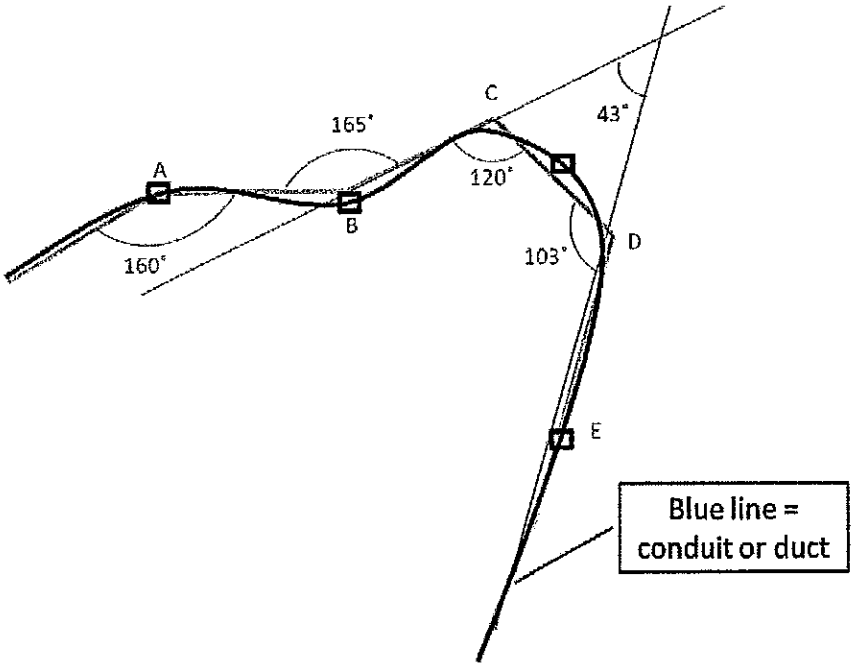
Install manholes every 600 feet. Where there are long continuous, straight runs, manholes may be placed up to 1200 feet apart with preapproval of the project engineer. When there is a planned change in direction of the conduit between manholes of greater than 45 degrees (cumulatively within a run), an additional manhole shall be installed in place of the directional change (Figure 5.5.5.1-1).

The top of the completed manhole shall be set above finish grade in unpaved areas to prevent water from ponding on the manhole. Place the top of the manhole 2 inches (2") above grade, plus or minus 1 inch (1"). Grade the backfill material downward and away from the manhole. A one-eighth-inch (1/8") per foot fall from the manhole top to finish grade, ten feet (10') from each edge of the manhole is recommended.

The manhole lower half shall be set on a four-inch (4") bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue or concern.

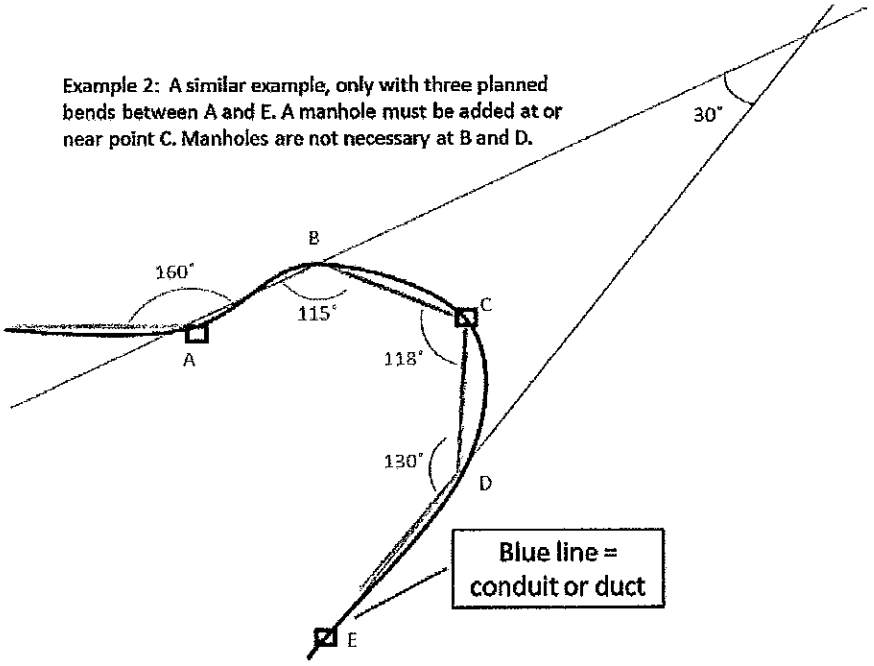
Backfill around the manhole in lifts commensurate with the soil and compact each backfill lift to the density of the surrounding earth.

Example 1: Bends at points A and B are greater than 45 degrees and are proper. Bends at planned manholes C and D each individually are greater than 45 degrees and are nominally proper, but in combination, they form a virtual angle of less than 45 degrees. Therefore, a manhole is required between points C or D. Measured angles shall take into account entrance and exit angles of the duct if entering or leaving a manhole or hand hole.



(A)

Example 2: A similar example, only with three planned bends between A and E. A manhole must be added at or near point C. Manholes are not necessary at B and D.



(B)

FIGURE 5.5.5.1-1. Adding a manhole at points of tight radius of a duct or conduit.

5.5.5.2 Hand hole installation
The top of the hand hole shall be set above finish grade in unpaved areas to prevent water from ponding on the hand hole. A one eighth inch (1/8") per foot fall from the manhole top to finish grade, ten feet (10') from each edge of the hand hole is recommended.

The hand hole shall be set on a four-inch (4") bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue/concern.

Backfill around the hand hole in lifts commensurate with the soil and compact each backfill lift to the density of the surrounding earth.

5.5.5.3 Manhole and hand hole penetrations
Where a steel conduit penetrates a wall of a manhole or hand hole, a grounding bushing shall be installed. These grounding bushings shall be connected to each other and to the earth ground system with 6 AWG tinned bare copper conductors.

Conduits entering a junction box or other electrical cabinets from underground shall be sealed with duct sealing compound. Expanding foam sealants are not allowed for this purpose.

Conduit connections to exterior boxes, electrical cabinets, or switches shall be made with weatherproof hub fittings.

5.5.6 Mandrel requirements

The contractor shall mandrel each duct or conduit installed and each existing duct or conduit in which cable is installed or replaced. As each conduit run is completed, proceed according to the following steps:

a. For conduit sizes 3 inches (3") and larger, draw a flexible testing mandrel approximately 12 inches (12") long with a diameter less than the inside diameter of the conduit through the conduit. Next, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs.

b. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs (see UFGS 33 71 02.00 20).

c. If the mandrel fails to pass through the duct being tested, either the duct is obstructed, misaligned, or the curve has too small a radius. If obstructed, use a high-pressure water jet to clear the conduit. Defective duct(s) shall be exposed and the defect corrected. After the duct(s) are repaired, repeat the mandrel test in that section of duct.

5.5.7 Spare ducts, preparation

Prepare spare ducts in the following manner. Install ¼ inch pull tape having a minimum tensile strength of 400 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc) unless cost prohibitive. Seal the open ends of spare ducts with removable tapered plugs of a type recommended by the duct manufacturers. Adapt the plug to firmly secure the pull tape.

5.5.8 Duct protection

All power cable ducts shall be securely fastened in place during construction and progress of the work, and shall be plugged daily at the end of work to prevent entrance of foreign material. A duct section having a defective joint shall not be installed.

All concrete-encased power cable ducts shall be raised at least 3 inches off the bottom of the trench using spacers ("chairs"). Bottom spacers may be secured to nominal one inch (1") boards to prevent sinking and overturning. This step shall be followed by a monolithic pour of concrete. Where two or more ducts are encased in concrete the contractor shall space them at not less than one and a half inches (1-1/2") (measured from outside wall to outside wall) using spacers applicable to the type of duct. As the concrete pour progresses, concrete not less than three inches (3") thick shall be placed around the sides and top of the duct bank. End bells or couplings shall be installed flush with the concrete encasement where required. Interlock spacers shall be used every five feet (5') to ensure a uniform spacing between ducts.

Joints in adjacent ducts shall be staggered a minimum of twenty four inches (24") apart and shall be made completely waterproof prior to covering with concrete.

5.5.8.1 Concrete mix specification

Concrete used in FAA ELD projects shall meet the cement, fine and coarse aggregate, and water specifications; mix design; compressive strength; and curing and protection requirements of FAA Advisory Circular AC-150/5370-10. Concrete for ELD structures such as pads and vaults shall have a minimum 28-day compressive strength of 3,000 psi when tested per ASTM C39. Concrete for concrete-encased ducts shall also meet the minimum strength requirement of 3,000 psi, unless otherwise directed by the FAA Resident Engineer.

5.5.9 Ducts without concrete encasement

Trenches for single-duct power cable runs shall be no less than six inches (6") or more than twelve inches (12") wide, and the trench for two or more ducts installed at the same level shall be proportionally wider. Trench bottoms for ducts without concrete encasement shall be made to conform accurately to grade to provide uniform support for the duct along its entire length. A three inch (3") layer of bedding material shall be placed around the ducts. The bedding material shall contain no particles that would be retained on a half inch (1/2") sieve. The bedding

material shall be tamped until firm. When two or more ducts are installed in the same trench without concrete encasement, they shall be spaced not less than two inches (2") apart (outside wall to outside wall) in a horizontal direction, or not less than six inches (6") apart (outside wall to outside wall) in a vertical direction.

5.5.10 Separation of cables

For non-distribution power cable installations in the vicinity of power cables, consult first with the FAA office of primary responsibility for guidance.

Subject to the approval of the FAA project engineer, separation of cables installed in conduit or duct shall be as follows:

a. Power cables of the same circuit shall be installed in the same conduit.
b. Conductors of circuits rated 600 volts, nominal, or less, ac circuits, and dc circuits shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway. Conductors shall have an insulation rating equal to at least the maximum circuit voltage applied to a conductor within the enclosure, cable, or raceway. (NEC 300.3 C 1)
c. Conductors of circuits rated over 600 volts, nominal, shall not occupy the same equipment, wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts, nominal, or less unless preauthorized by the FAA project engineer and permitted in NEC 300.3 (C)(2)(a-e).
d. Except in circumstances authorized by the FAA project engineer, power cables shall not be installed in the same duct systems with communication, control, and signal cables.
e. If joint-use applications apply and are authorized, power cable shall be installed in its own separate conduit. This conduit shall be separated a minimum of three inches (3") outside wall to outside wall, from conduits that contain communications, control, and signal cables. The actual separation for each specific case shall be stipulated by the FAA project engineer.
f. Fiber optic, communications, and control cables shall have completely separate and clearly identified and marked hand holes, pull boxes, and junction boxes.

5.5.11 Installation of cables

To minimize splicing, the longest practicable lengths of cable shall be pulled into the ducts at one time. Unless otherwise specified, electrical power manholes and hand holes shall be as far apart as practicable based on the pulling specification of the cable installed. Typically, manholes and hand holes are installed 600 ft apart and at all points where directional change of the duct system is greater than 45 degrees. For long, straight, continuous runs, spacing may be increased, not to exceed 1,200 ft, provided cable manufacturer's specifications for pulling tension has been met, and subject to the project engineer's oversight. To meet grounding requirements of underground multigrounded neutral cable systems over 1000 V, under no condition shall the distance between manholes or hand holes exceed 1,200 ft in accordance with NFPA 70 (NEC) Rule 96C, and ANSI C2 (NESC) standards.

Splicing lengths of cables of different construction types together is not allowed. For example, do not connect shielded cable to concentric cable, or shielded cable to old unshielded cable. Exceptions to this rule will require written PSG approval before installation.

Where a power cable duct or conduit crosses a runway or taxiway, manholes and hand holes shall be placed just outside the RSA/TSA boundaries on opposite sides of the crossing. This will allow for adequate working space to avoid penetrating the safety areas during installation and maintenance activities.

The contractor shall verify that the duct is open, continuous, and clear of debris or blockage (use mandrel) before installing cable. Cable shall be installed in a manner to prevent harmful stretching of the conductor or damage to the outer protective covering or conductor insulation. Until connections are made, cable ends shall be sealed using adhesive-lined, heat-shrink end caps. Where more than one cable is to be installed in one duct, cable shall be pulled at the same time. In no case shall a splice be pulled into a duct or conduit.

When cable cutting is required, cable ends shall be effectively sealed against moisture immediately after cutting, using end caps as above. Bends of a radius less than eight (8) times the diameter for rubber-covered or plastic-covered cable, or twelve (12) times the diameter for metallic armored cable, shall not be made. Cable that has been kinked shall not be installed.

When unreeling, an observer shall be stationed at the reel to report cable irregularities. Unless specifically stated in the drawings, cables for installation in ducts or for direct burial shall comply with FAA-E-2013D and FAA-E-2793A. Specifically excluded are bare concentric neutral wire cable types. Grounding conductors, where required, shall be a minimum size of 6 AWG bare copper wire. Fire wrap medium voltage cables in all manholes and hand holes.

5.5.12 Cable pulling

The below provisions on cable pulling shall be followed unless otherwise specified on the submittals matrix (Appendix E).

The contractor shall obtain from the manufacturer an installation manual or set of instructions that address such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure.

The contractor shall then perform pulling calculations and prepare a pulling plan, which shall be submitted along with the manufacturer's instructions. Cable shall be installed strictly in accordance with the cable manufacturer's recommendations, ANSI/IEEE C2 standards, and the authorized installation plan.

The pulling plan shall include:

a. Site layout drawing(s) with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.

b. List of cable installation equipment.

c. Lubricant manufacturer's application instructions. Corrosive lubricant is prohibited.

d. Procedure for resealing cable ends to prevent moisture from entering cable.

e. Cable pulling tension calculations of all cable pulls (calculated values, not maximum values).

f. Cable percentage conduit fill.

g. Cable sidewall bearing pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio. Refer to Appendix B, item 4).

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device (see UFGS-33 71 02.00 20).

Prior to pulling cable, pump the water out of the manholes and pull a mandrel/swab 1/4 inch smaller than the duct diameter through duct run to ensure adequate opening of duct run. Thoroughly swab conduits to remove foreign material before pulling cables.

Cables shall not be pulled from an outdoor (exterior) location when the outdoor (exterior) air temperature is below the cable manufacturer's minimum recommended pulling temperature.

Contractor shall furnish required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but be not limited to, framework, sheaves, winches, cable reels and/or cable reel jacks, duct entrance funnels, pulling tension gauge, and similar devices.

The diameter of the sheaves shall be at least 10 times that of the diameter of the largest cable. Equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used. Cable installation may be accomplished using a power winch or by hand.

Cable pulling lubricant shall be used to ease pulling tensions. The lubricant shall be compatible with the jacket material. The FAA project engineer will authorize the pulling compound. Lubricant shall be water or silicone based so as not to injure the cable material used. Wax-based

lubricants are not allowed. Lubricant shall not harden or become adhesive with age. Petroleum grease shall not be used.

Cable ends shall be sealed and firmly held in the pulling device during the pulling operation.

Use of a tensiometer is required for cable-pulling operations. Actual pulling tensions shall be continuously monitored and compared to both (1) calculated pulling tensions as in item "e" above, and (2) maximum allowable pulling tensions as in item "j" above. If actual pulling tension exceeds calculated pulling tension by 30% or more, the pulling operation shall be suspended and the project engineer consulted for investigation of a possible pulling obstruction or other anomaly. The cable pulling operation shall not exceed maximum allowable pulling tension. See Figure 5.5.12-1.

During pulling operations, several personnel shall be stationed at key points to ensure safety to cable and personnel: at duct entry, duct exit, cable feed, and at the pulling machinery.

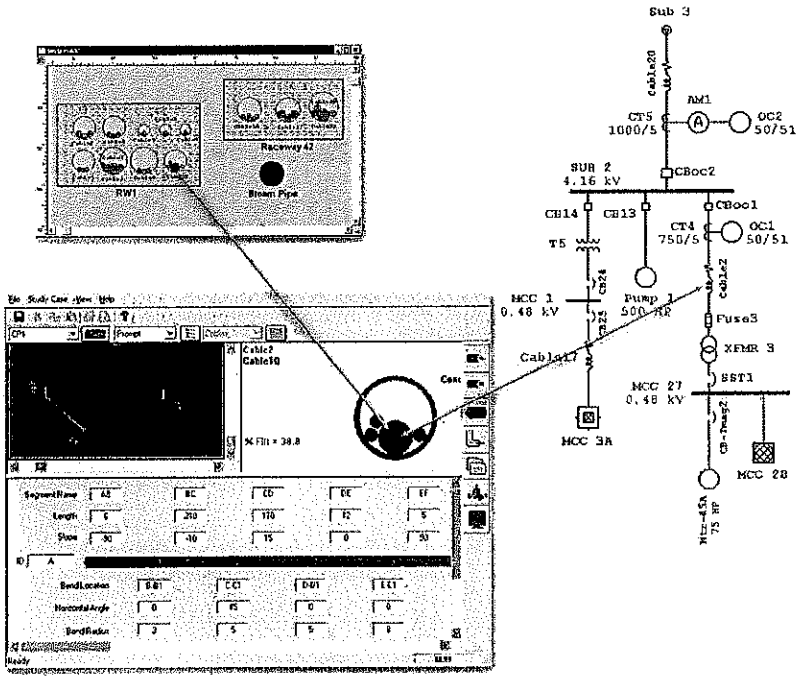


Diagram courtesy of ETAP Cable Systems Software

FIGURE 5.5.12-1. Industry software is readily available to assist with pulling calculations.

Avoid abrasion and other damage to cables during installation. The surface of a cable sheath or jacket shall not be damaged to a depth greater than one tenth ($1/10^{th}$) the original thickness or be flattened out-of- round more than one tenth ($1/10^{th}$) of the outside diameter.

Where cables are left in manhole or switchgear overnight or more than 8 hours prior to termination, the cable ends shall be sealed with paraffin or shrink wrap caps and supported in a

manner which will prevent entrance of moisture into the cable. Cable shall be terminated and energized as soon as possible.

Table IV lists example maximum pulling tensions for commonly installed cables (see also Appendix B for a pocket guide on calculation method).

The table is for illustration purposes only; it is the designer's and/or installer's responsibility to obtain the manufacturer's data for the cable chosen for installation. The manufacturer's data shall be used in conjunction with the pull-configuration(s) proposed, cable type and ampacity, size of conduit, distance, grade, degree of sweeps/bends, proper lubricant, etc, to calculate the maximum tension for each cable pull. The resulting value shall not exceed cable maximum tension and maximum sidewall pressure values.

5.6 Medium-voltage direct earth buried cables

Direct earth buried (DEB) cables are to be avoided. However, if preauthorized per the FAA-approved drawing set and construction specifications, DEB cable construction shall meet the following requirements. Coordinate underground power cable installation work to avoid interference with other airport projects and with existing utilities.

General--The contractor shall excavate trenches for direct-earth burial cable as follows:

a. To the depth specified in paragraph 5.4.1b.

b. To a width of not less than four inches (4") for single or six to eight inches (6-8") for multiple runs of power cable.

c. To a width and depth that will provide horizontal or vertical separation of power cables from other power cables of different voltage ratings, or from power cable and a control or signal cable.

d. Where soil is known to be rocky, select backfill for cable protection. Backfill shall be firmly tamped in the separation area.

e. Restoration shall be in accordance with paragraph 5.5.3.

Unless otherwise specified, power cables in the same location and routed in the same general direction shall be installed in the same trench. Trenches for cables may be excavated manually or with powered trenching equipment. Cable plows shall not be used unless express permission is granted by the FAA project engineer. When rock is encountered, remove to a depth of at least 3 inches (3") below the cable and fill the space with sand or clean earth free from particles larger than 1/4 inch. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where materials in bottoms of trenches are other than sand, a 3-inch layer of sand shall be laid first and

TABLE IV. Maximum allowable non-armored cable pull tensions using dynamometer or rope.

CABLE	TENSION (Pounds)	ROPE DIAMETER (INCHES) Cotton	Manila	Dacron	Nylon
2 - 1c #8 Solid	264	3/16			
3 - 1c #8 Solid	264	1/4	3/16		
4 - 1c #8 Solid	422		1/4		
2 - 1c #6 Stranded	420	1/4	3/16		
3 - 1c #6 Stranded	420	5/16	1/4		
4 - 1c #6 Stranded	672	3/8		3/16	
1 - 2c #8 Stranded	264	1/4			
1 - 3c #8 Stranded	396	1/4			
1 - 4c #8 Stranded	528		1/4		
1 - 2c #6 Stranded	420	1/4	3/16		
1 - 3c #6 Stranded	630	5/16			
1 - 4c #6 Stranded	840	3/8	5/16	3/16	
1 – 1c #4 Stranded, Conc Neut (CN)	334	For pull rope sizes, consult manufacturer (etc)			
2 – 1c #4 Stranded, CN	668				
3 – 1c #4 Stranded, CN	1,002				
4 – 1c #4 Stranded, CN	1,069				
3 – 1c #2 Stranded	1,593				
4 – 1c #2 Stranded	1,699				
3 – 1c #2 Stranded, CN	1,856				
4 – 1c #2 Stranded, CN	1,962				
3 – 1c #1/0 Stranded	2,534				
4 – 1c #1/0 Stranded	2,703				
3 – 1c #1/0 Stranded, 600 V	2,955				
4 – 1c #1/0 Stranded, 600 V	3,124				

Legend: No. of cables - No. of conductors (c)/ Gauge (AWG)
Note: The above figures are to be used as a guide only. Consult with the manufacturer for exact maximum pull tensions for a given cable type. Ensure conformance with the ANSI/IEEE C2 standards.

compacted to approximate densities of surrounding firm soil. Trenches shall be in straight lines between cable markers. Bends in trenches shall have a radius of not less than 36 inches (36") consistent with the cable manufacturer's published minimum cable bending radius for the cable installed. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed.

Trenches shall be opened only for the time required to install, inspect and survey the cables in accordance with FAA Advisory Circular 150/5370. The trench shall be closed in the same working day or marked, barricaded and/or lighted according to current airport specifications and requirements.

Installation in trench--Direct earth burial cable shall be unreeled in place along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position shall not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Dragging cables over the ground shall not be permitted.

Separation of cables--Separation between direct earth burial cables shall be as follows:

a. Power cables may be laid together in the trench. In these instances, there shall be a minimum of 3 inches (3") of separation between cables.

b. Non-power cables (fiber optic, communications, and control cables) shall be installed in a separate trench from power cables (exception: DEB power cable crossing a control cable at the perpendicular and with 12 inches [12"] vertical separation). A concrete marker indicating the presence of power cables shall be installed along the route of the trench.

c. Where cables of different types (power and control or signal) or of different voltages are installed together as stated in (a) and (b) above, the individual cables or groups of the same type cables shall be clearly and unambiguously identified by installing metal or approved plastic tags indicating the type (power, control or signal) and voltages for power cables. These tags should be installed in accordance with Section 5.11.

d. Backfill that serves to separate cables shall be firmly tamped.

Bends--Bends in cables shall have an inner radius not less than those specified in NFPA 70 for the type of cable, or manufacturer's recommendation.

Splicing--Where splices are required, provide splices designed and rated for direct burial. See splicing Section 5.9 for instructions. All splices shall have their neutrals/shield solidly grounded.

Slack loop--A slack loop shall be provided at each end termination point of a cable to facilitate any future repairs. Slack loops shall have no bends with an inner radius less than twelve times the outside diameter of the cable. Where cable is brought above ground, additional slack shall be as shown by the drawings or as directed by the FAA.

Backfilling--After underground medium-voltage DEB cable has been installed and inspected, the trench shall be backfilled. The first layer of backfill shall be 3 inches (3") deep, loose measurement, and shall be either earth or natural sand containing no material aggregate particles that would be retained on a one quarter inch (1/4") sieve. This layer shall not be compacted. The second layer shall be 9 inches (9") deep, loose measurement, and shall contain no particles that would remain on a one inch (1") sieve.

The remainder of the backfill shall be excavated or imported material (if necessary) and shall not contain stone aggregate larger than 4 inches (4") maximum diameter. The second and subsequent layers shall be thoroughly tamped and compacted to the density of the adjacent undisturbed soil.

Thermal resistivity--Trench backfill shall have a soil thermal rho of 90°C-cm/W or less.

Screening/sieving-- Compacted trench backfills shall meet ASTM D422 and ASTM D698, shall be sufficiently compacted, and shall not have backfill lifts that are too thick. Failure to prepare backfill properly will result in degraded thermal capability of the cable system.

5.7 Cable installation in manholes

Cables shall be carefully formed on nonmetallic racks around the interior of manholes or hand holes, avoiding sharp bends or kinks. Ensure that enough cable is coiled in the manhole so that a number of splice repairs can be made without having to fully enter the manhole. Tie splices and cables to cable racks using one eighth inch (1/8") nylon line. Splices shall be a minimum of two feet (2') from the mouth of the duct opening into the manhole or hand hole. Where this is not possible, splices shall be located as advised in the manhole/hand hole specification or drawing. Splices in different cables shall be staggered.

5.8 Cable terminations, connections, surge protection, and fault protection

5.8.1 Cable terminations and connections

Installation of prefabricated cable terminations shall strictly conform to manufacturer's installation recommendations using proper specialized tools. A cable manufacturer's representative shall be present at least in the initial phase to provide guidance to the installation team. Special care shall be exercised to use the proper ratings and physical dimensions.

5.8.2 Connections to a three-phase engine generator

When providing backup power to other facilities, connect the two new single-phase legs to the lowest loaded phases of the generator. The lowest loaded phases shall be determined by performing a load reading. This reading shall be confirmed by referring to the history of the technical performance record (TPR).

5.8.3 Surge protection

Apply surge protection in accordance with the following standards:

a. For FAA-owned low voltage power systems (600 V or less) at or after the facility service entrance, surge protection devices (SPD) shall be applied in accordance with FAA-STD-019.

b. In ELD installations, a fused disconnect switch may be installed before the TVSS and connected to the line side of the service. The TVSS must be a UL 1449 (third edition) Type 1 device, which allows for protected line-side connection.

c. Surge protection for the 1000 V to 15 kV medium voltage range shall be implemented in accordance with ANSI/IEEE C62.11 and NEC Article 280.

d. Limit nominal voltage of ELD systems to 34.5 kV. For any other voltages, consult with the office of primary responsibility.

The following guidelines apply to locating and installing surge protection devices (SPD) (see Appendix A for product operating parameters).

a. If an FAA-owned distribution transformer is fed from an overhead line by means of a medium voltage cable, surge arresters of the metal-oxide varistor (MOV) type shall be installed at the pole top and at the transformer between each phase and ground. The pole type arrester shall be of the intermediate class, while the transformer surge arrester shall be of the distribution type. The continuous voltage rating of the arresters shall be determined in a protection and insulation coordination study. As a further protection against direct lightning, intermediate arresters shall be installed one span before and after the interconnection of transformer. Surge arrester leads connecting to cable conductor and grounded metal shield must be as short as possible to minimize the protective voltage level. This recommended surge protection scheme is illustrated in Figure 5.8.3-1.

b. If an FAA-owned distribution transformer is fed from a station transformer directly by means of a medium voltage underground cable, a distribution arrester shall be installed at both ends of the cable in accordance to the guidelines provided in paragraph (a) above.

c. Install surge arrestors of the proper class on transformers.

d. Unless otherwise shown on the drawings, surge arresters are not required on medium-voltage switchgear and sectionalizers.

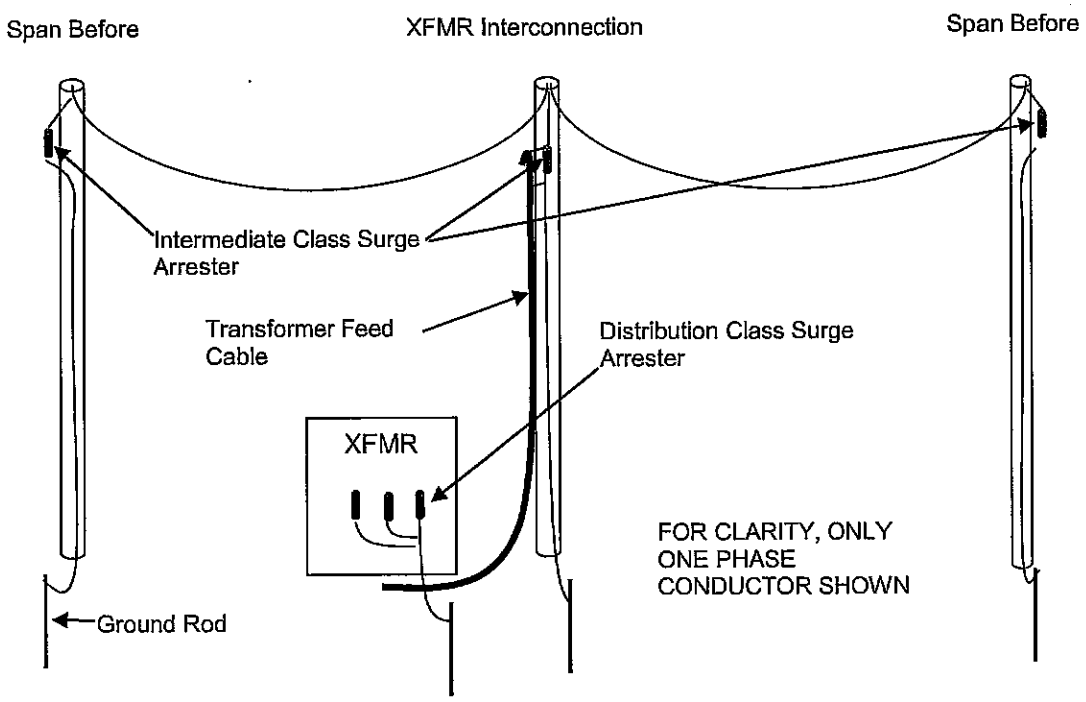


FIGURE 5.8.3-1. Schematic representation of recommended surge protection system.

5.8.4 Fault isolation

Use sectionalizers to protect the underground electrical line distribution circuit as a whole from electrical faults. This shall be accomplished by isolating faults to single National Airspace System (NAS) facilities versus multiple facilities ("daisy chained"). Where existing power cable layouts do not permit the isolation of individual facilities, add a sectionalizer.

Similarly, do not connect transformer primaries in a given electrical line distribution (ELD) service together in parallel such that a single power cable or transformer fault upstream will be allowed to deenergize downstream loads in the ELD circuit, thereby disabling multiple NAS facilities.

5.9 Splices

Whenever possible and while still meeting required cable grounding standards, splices are to be avoided. Splices on multiple cables in a trench shall be staggered. Cable ends to be spliced shall be kept free from moisture by using tape or caps. Cable runs shall be given continuity and insulation resistance tests per this specification at the completion of each splice. When conducting FAA-authorized third-party testing, at the completion of the installation of each cable section (from termination to termination), subject the cable section to a 50/60 Hz partial discharge test in accordance with IEEE 400.3 at up to 2.5 times operating voltage level for a duration not to exceed 30 seconds, while the cable section is disconnected from the rest of the

system. Any partial discharge within a splice shall comply with the requirements of IEEE 404. Splices are not to be drawn inside of any conduit or duct.

Buried and nonseparable T and Y joints shall not be used. These joints are inherently unreliable and cannot be properly commissioned with partial discharge diagnostics. Finding a fault becomes more difficult and harmful to existing cable assets. In addition, faults due to these types of unreliable joints can cause failures in multiple facilities due to a lack of sectionalizing.

Each cable splicer shall be qualified in making cable splices and in the use of specified cable splicing kits and specialized tools. The contractor shall obtain FAA authorization of the splice and cable splicer prior to making field splices. Cable splicing methods and materials shall be of a type recommended by the splicing materials manufacturer for the cable to be spliced, and a cable manufacturer's representative shall be present at least in the initial phase to provide guidance to the installation team. Splices shall be as follows.

a. Medium voltage power cables (600 volts and above). Use cold-shrink splice kits. The contractor shall make sure that the proper kit and tools are used for each application. The cold shrink product shall meet ANSI/IEEE Std. 404 (for a 15 kV rating).

b. Power cables 600 volts and below. Use heavy-wall self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006, poured epoxy splice, or any other splicing means approved by ANSI standards.

c. Cable armor and shields. Armor and shield may be folded back prior to splicing, then reinstalled across the splice and bonded by the use of authorized bonding clips, or soldering when copper material is used. If the armor is galvanized material, it shall be bolted. Excess threads should be cut from bolts and wrapped with butyl tape so there are no sharp projections prior to using heat-shrink tubing.

d. Evaluation of products. As a submittal to FAA, the contractor shall provide the product drawings showing details of the splicing methods to be used, and a statement documenting the 3-year experience qualification of the contractor in making splices on underground systems with the proposed product (reference FAA Advisory Circular 150/5370-10). In addition, products shall meet the latest editions of standards in Table V.

TABLE V. Cable splicing specification equivalents.

APPLICATION STANDARD	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

5.10 Equipment racks and disconnect switches

Equipment racks - If vertical supports for equipment racks supporting disconnect switches are separated by more than 6 feet, add a middle (third) vertical support.

Main disconnect switches – Ensure that installed MDSs meet NEMA 3R for typical applications, NEMA 4X for corrosive environments. If required by the designer, use bollards to protect the installation from vehicle impacts. Construct pads of concrete, or use prefabricated composite pads.

Lightning protection of equipment racks – Air terminals shall be installed on each end of an equipment rack, regardless of rack width or proximity to a zone of protection of other nearby facilities. Air terminal selection and grounding shall conform to FAA-STD-019.

5.11 Grounding of ELD systems

Local published standards may take precedence over the national standard. In the case of ambiguity or significant deviation, contact Power Services Group, Power Cable Program Office, to provide a technical evaluation. ELD system grounding shall comply with FAA-STD-019, NFPA 70, IEEE C2, and in accordance with the specific guidance provided herein.

Typical FAA medium-voltage ELD elements to be grounded include:

a. Power Cables – ground the multigrounded neutral wires and shields,
b. Guard wires,
c. Manholes and hand holes,
d. Equipment and equipment enclosures,
e. Surge arresters,
f. Steel conduits and fittings based on application,
g. Direct earth buried power cables – multigrounded shields,
h. Abandoned power cables--ground the conductor(s) and the multigrounded neutral wires and shields (if present).

Typical FAA low-voltage ELD elements to be grounded include:

a. Low-voltage cable segment between a facility transformer and the service entrance,
b. Service entrance disconnects, meter bases, and associated equipment,
c. Service entrance equipment racks.

5.11.1 Power cables, multigrounded neutral wires and shields

The FAA ELD systems follow the same practice as multigrounded (solidly grounded, reactance grounded) medium voltage neutral systems in common use by the electric utility companies.

FAA power cables (both in conduit and DEB) shall be effectively grounded by ground connections of sufficiently low impedance levels (< 7 ohms), and have sufficient current carrying capacity to limit the buildup of voltages to levels below those that may result in undue hazards to persons or connected equipment.

Multigrounded system—FAA medium voltage cables typically use metallic shields that require grounding (NEC requirement above 5 kV). The shields confine electric fields within the cable to obtain uniform radial distribution of the electric field, protect against induced voltages, and reduce the shock hazard risk to personnel. To effectively ground the shield, install multiple grounds to the cable neutral conductor to limit the voltage rise to 25 volts maximum (measured from neutral to earth ground) per IEEE Std 525. This shall be accomplished by connecting the neutral of the multigrounded system to electrodes at each transformer location and at a sufficient number of additional points totaling not less than four ground points in each mile of the entire line (every 1300 ft / 400 m [¼ mile], or less), not including grounds at individual services. This rule applies to underground jacketed shielded cable and to jacketed concentric neutral cable. (Ref NESC Section 9, Rule 096, *Ground Resistance Requirements – Multigrounded System)*. The same practice applies to different kinds of cables; for example, concentric wire, tape shield, etc.

Bonding across joints--Apply a shield bonding jumper wire across cable splices.

DEB cable shield and separate neutral conductor grounding – Ground direct earth buried cable shields and shields of separate neutral conductor cables at least eight times per mile (not to exceed 660 ft spacing), not including grounds at individual services, in accordance with NESC C2, Rule 354.D.3c).

Service Laterals--For service laterals, when two disconnects are separated by 200 feet or more, neutral-to-ground bonds are required at both locations in accordance with the national electrical safety code (NESC). When the distance is less than 200 feet, the disconnect closest to the transformer shall have the neutral to ground bonded. Typically, this is the first disconnecting means in accordance with the National Electrical Code (NEC).

5.11.2 Cable guard wires

Guard wires protect the power cable from lightning surges. The contractor shall install cable guard wires for all buried cables and conductors not routed in ferrous conduit to protect underground conductors from the effects of lightning discharges. A 1/0 AWG bare copper stranded guard wire shall be used. The guard wire shall be embedded in the soil a minimum of 10 inches (25 cm) directly above, centered and parallel to the cable and/or duct to be protected.

When the width of the cable run or duct does not exceed 3 ft (90 cm), one guard wire centered over the cable run or duct shall be installed. When the cable run or duct is more than 3 feet (90 cm) in width, two guard wires shall be installed. The guard wires shall be spaced at least 12 inches (30 cm) apart and not be less than 12 inches (30 cm) or more than 18 inches (45 cm) inside the outermost wires or the edges of the duct.

The guard wire shall run continuously along the cable/duct run with no deviations from the run of the duct, and with no gaps. The guard wire shall be bonded to the earth electrode system (EES) at each end and to ground rods at approximately 90-foot intervals using exothermic welds. The spacing between ground rods shall vary by 10% to 20% to prevent resonance. Install the ground rods approximately 6 feet (2 m) on either side of the trench and connect them via jumper wire to the continuously running guard wire as shown in Figure 5.11.2-1. The jumper wires shall be swept away from the guard wire in a repeatable pattern such that a lightning impulse will always be able to follow a curved path to ground within 180 ft. of any point along the run. Maintain a minimum 9-in. radius bend in the jumper sweeps.

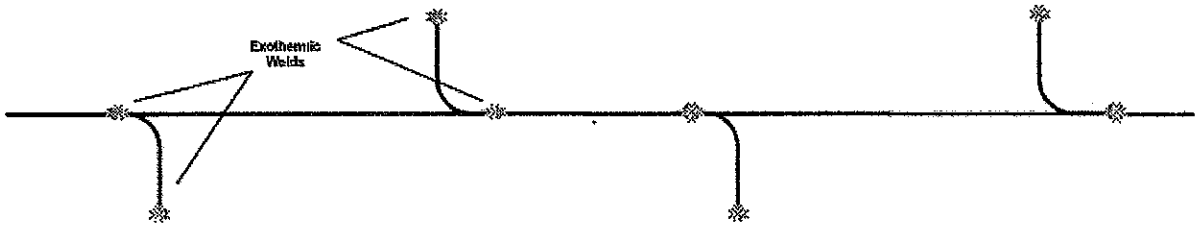


Figure 5.11.2-1 Grounding of cable guard wire. Note the alternating direction of the sweeps of the jumper wires. This pattern is required for the proper protection of the power cable.

For difficult excavations, such as rock formations or permafrost, the ground rods may be driven 3 feet on either side of the trench.

5.11.3 Manholes and hand holes

Power and control cables shall be installed in separate manholes and hand holes.

Until ready for acceptance testing, no installation work shall involve energized systems. Install power cables, ground wires, grounding loops, and manhole racks and furniture in such a way as to give maximum safe clearance space for personnel to enter the manhole when conducting subsequent operation and maintenance tasks. Conductors shall be placed well out of the way of human ingress/egress pathways through the manhole or vault. During acceptance inspection, manhole installation configurations that are found to be untidy and/or lacking in clearance for later maintenance tasks shall be required to be redone at the contractor's expense.

If space is available, cable slack sufficient for one splice for each cable shall be left in each manhole. Elimination or shortening of slack lengths shall require authorization by the FAA.

All new and existing cable in manholes shall be secured to nonmetallic racks on the manhole walls. Cables shall be secured to racks or mounted on a heavy duty nonmetallic multi-mount cable support arm.

Jumper cables shall be routed in such a manner that through-air clearance between adjacent conductors, and between conductors and any metallic or grounded surface, is maintained.

Physical dimensions of manholes may be altered to fit requirements. The following procedure covers the minimum grounding requirements (Figure II):

a. Install a solid, bare copper bus bar inside the manhole, or alternatively, run a 4/0 bare copper conductor along the inside of the manhole, creating a grounding surface about 12 inches (12") above the finished floor. Arrange bus bar or conductor so as to avoid interference with duct entrances into the manhole, and construct of sufficient length to facilitate repair and future installation operations.
b. Bond all cable shields (or steel interlocked armor if used) to the bus bar in accordance with the manufacturer's directions. Bond other metallic bodies to the bus bar with a minimum 6 AWG bare copper conductor using mechanical connections and two-hole lugs.
c. Connect and exothermically weld the 1/0 AWG guard wires to the outside ground rods on each side of the manhole, ensuring 10 feet (10') distance from the outside of the manhole to the ground rod.
d. If feasible, all connections, sweeps, or curves in the grounding system shall be smooth and shall be of at least 8 inch (8") radius no matter what the orientation (vertical or horizontal).
e. All splices inside a manhole shall be solidly grounded, with jumpers running across the joints to connect the cable shields.
f. Mechanically connect and bond the manhole frame to the bus bar using two-hole lugs and a 6 AWG solid copper ground conductor.
g. Apply expandable foam duct sealant at openings to prevent water and gas from entering manholes.
h. Hand holes follow the same basic principles as above, with appropriate modifications.

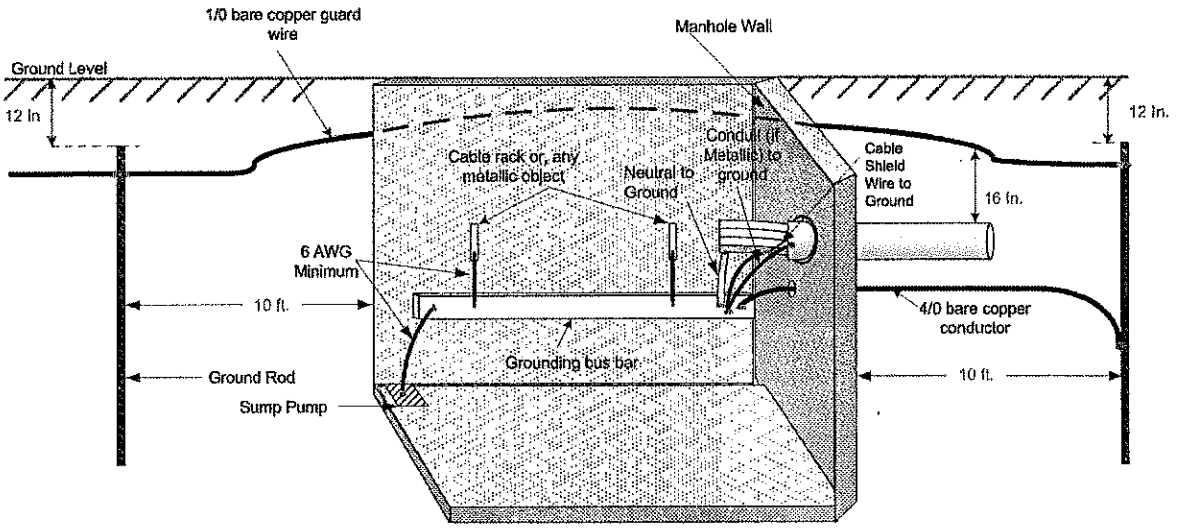


FIGURE 5.11.3-1. Grounding and guard wire installation detail at a manhole.

Where multiple conduits enter manholes, the following schemes illustrate guard wire grounding methods (all sharp corners to be rounded out) (Figure III).

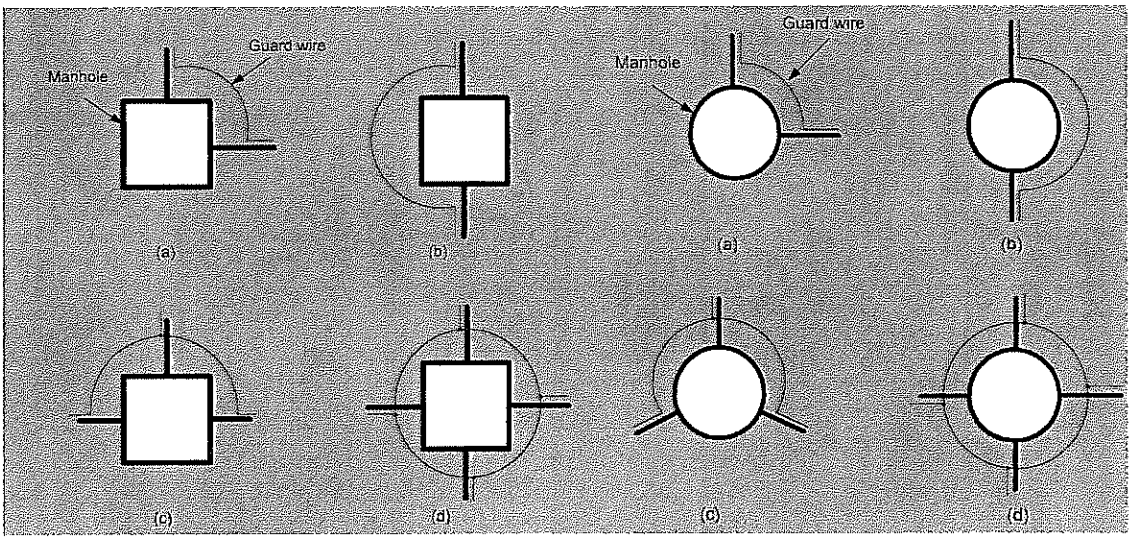


Figure 5.11.3-2. Guard wire grounding schemes.

5.11.4 Equipment and equipment enclosures

Where feasible, ground ELD equipment and equipment enclosures in accordance with NESC ANSI C2 Section 38, Rule 384 (for medium voltage equipment), FAA-STD-019 (for low voltage equipment), and IEEE 80 (when bonding grounding conductors to FAA NAS earth electrode systems).

For FAA ELD systems, ground rods shall be interconnected by a buried, bare, 4/0 AWG copper conductor (ground loop or counterpoise). Connections to the ground rods shall be exothermically welded. The interconnecting conductor shall close on itself forming a complete loop ("ground ring" or "counterpoise") with the ends exothermically welded.

Pad-mounted transformers and other pad-mounted equipment—At a minimum, install a single ground rod. Bond the transformer equipment frame and other non-current-carrying metal parts, such as cable shields, cable sheaths and armor, metallic conduit, and other non-current-carrying metal parts to the equipment counterpoise using exothermic welds. Ground the secondary neutral.

Equipment racks—Install a counterpoise 2' to 6' from equipment racks. Counterpoise shall consist of bare 4/0 copper conductors and driven ground rods around the rack. Ground the equipment rack and equipment and other non-current-carrying metal parts to the counterpoise using exothermic welds. If equipment rack is within 15 feet of a shelter having an existing FAA NAS EES, a connection between both counterpoises shall be made.

Connect metallic conduits that terminate without mechanical connection to the enclosure by grounding bushings and grounding conductor to the equipment ground bus.

Route cables within switchgear and enclosures in a manner which will allow room for bending and terminating of cables. Cables shall be secured in a manner that will not result in cable weight being placed on the termination electrical joint. Cable support shall be made in a manner that does not force cable against grounded metal or that compresses cable diameter. Cable training bend radius shall be at least 12 times cable diameter or shall not be installed.

Route jumper cables in a manner that maintains through-air clearance between adjacent conductors and between conductors and any metallic or grounded surface.

5.11.5 Surge arresters

Follow detail drawings in the drawing set for surge arrester grounding. For ungrounded and single-grounded systems, modify the requirement in accordance with IEEE C2 and UFC 3-550-03FA.

Bond surge arresters and neutrals directly to a transformer enclosure and then to the grounding electrode system using a bare copper conductor. Keep lead lengths as short as possible with no kinks or sharp bends.

5.11.6 Conduit and fittings

Conduit joints and fittings shall be electrically continuous between joined parts. Ferrous conduit enclosing power conductors to FAA facilities shall be terminated using conductive fittings to their respective junction boxes, equipment cabinets, enclosures, or other grounded metal structures.

5.11.7 Low-voltage cable runs to facility service entrances

The ELD low-voltage (≤ 600 V) cable runs coming from a commercial utility power meter and feeding power to FAA facility service entrances are considered to be FAA owned and operated utility distribution systems and shall follow the grounding and safety requirements of IEEE C2/NESC. Wiring after the distribution service delivery point (usually at the terminals of the service equipment but always as close to the FAA facility as possible) is generally considered premises wiring and shall follow NEC/NFPA 70 Section 250, *Alternating Current Systems between 50 V and 1000 V.*

For the grounding requirements of service laterals, consult the grounding section of this specification.

There are gray areas in determining which electrical safety and grounding codes apply (NESC or NEC); consult the office of primary interest to determine whether a segment is distribution or premises wiring.

5.11.8 Installation details

5.11.8.1 Installation of equipment counterpoise and ground rods

To meet site grounding requirements, install equipment counterpoise and ground rods according to the design drawings to ensure that the desired grounding values are achieved at all points of the ELD system.

Equipment counterpoise (pad mount loop) – Where not on or within 15 feet of an FAA NAS earth electrode system (EES), install bare 4/0 AWG copper conductors in a loop not less than 12 inches (12") below finished top of soil grade, or consistent with IEEE 80. Connect the counterpoise to ground rods using 4/0 AWG copper conductors and exothermic bonds.

When installing the pad mount loop on or within 15 feet of a NAS EES, a deeper burial depth may be required. Consult FAA-STD-019 or the project drawings.

Ground rods - Drive cone-pointed ground rods to full depth plus another 12 inches below grade. Ensure that the installation provides an earth ground of the appropriate value for the particular equipment being grounded. Neatly and firmly attach and exothermically weld ground rods to the counterpoise and keep the amount of exposed bare wire to a minimum.

5.11.8.2 Grounding and bonding connections at or within equipment enclosures

When feasible, where grounding connections are buried, external to equipment enclosures, or otherwise normally inaccessible and/or uninspectable, use exothermic welds. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds that are "puffed up" or that show convex surfaces indicating improper cleaning are not acceptable. No mechanical connectors shall be made below grade.

Mechanical connections within equipment enclosures above grade shall employ bolted solderless connectors, in compliance with UL 467.

5.11.8.3 Routing grounding and bonding conductors

Connect and bond transformer enclosures and equipment frames to the grounding counterpoise system. Size grounding and bonding conductors in accordance with the drawings. Bends less than 90 degrees are not permitted. Avoid routing ground conductors through concrete. When concrete penetration is necessary, cast nonmetallic conduit flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor. Seal the opening with a sealing compound after installation.

5.11.8.4 Grounding cable across expansion joints

For grounding cables that cross expansion joints or similar separations in structures and pavements, use approved devices or methods of installation to provide the necessary slack in the cable across the joint to permit movement. Use stranded or other approved flexible copper cable across such separations.

5.11.8.5 Grounding of armored cable and metallic conduit
Apply the following requirement during initial cable installation. For medium voltage systems, bond cable armor and/or metallic conduit to the earth electrode grounding systems of the connected equipment at both ends with a 2 AWG conductor, including at splices in manholes and hand holes. An armored bonding jumper shall be installed across each splice. For low voltage systems, bond the cable armor to the ground bus of the service disconnecting means at the electrical service entry point. Bonds shall be electrically continuous between joined parts (see FAA-STD-019).

5.11.8.6 Grounding metal splice cases
Ground metal splice cases for medium-voltage direct-burial cable by connection to a driven ground rod located within 2 feet of each splice box using a grounding electrode conductor having a current-carrying capacity of at least 20 percent of the individual phase conductors in the associated splice box, but not less than No. 6 AWG.

5.11.8.7 Grounding Riser poles
Directly connect equipment, neutrals, surge arresters, and items required to be grounded to the single continuous vertical ground rod conductor (No. 2 AWG minimum) on each riser pole. Ensure that ground rod conductors are stapled to wood poles at intervals not exceeding 2 feet.

5.12 Cable tagging, equipment markers and labels, and safety signs

5.12.1 Cable tags

Individual cables or groups of the same type of cable shall be clearly and unambiguously identified in accessible locations such as manholes, hand holes, junction boxes, and pull boxes by means of a minimum of two tags per cable, one near each duct entrance hole. Unless otherwise specified in the contract documents, cable tags shall be constructed of metal, or of rigid laminated plastic of at least 1/16" total thickness.

Plastic tags shall be exterior classified and consist of two plies: a plastic base and a 0.005" surface of impact acrylic plastic for front engraving. The tag shall be ultraviolet (UV) light stable. Engraving shall be done with 1/4-inch minimum lettering (white background and black letters). Tags shall be attached to the both terminated ends of the cable with two UV-rated nylon or stainless steel cable ties.

Cable terminations and potheads shall be tagged as to function, including facility which they serve, and any pertinent data. Tags shall be marked with an abbreviation of the name of the facility or facilities served by the cable plus the letter "P" (Power). Where more than one identical cable is used to serve the same facility, cables may be bundled under one tag unless job plans state otherwise.

5.12.2 Equipment markers and labels

Design and select equipment markers and labels for exterior use.

5.12.2.1 Exterior equipment identification tags, labels, and plaques
Aluminum tags, or any other tags or labels approved by the project engineer, shall be printed with numbers to identify ELD equipment. Attachment options include wires and ties, or screw mounts, nails, or bolts. Contrasting colors shall be considered when ordering tags and labels. Plaques may be made of laminated plastic.

5.12.2.2 Warning and safety signs and labels
To minimize accidents, manufacturers of electrical products use ANSI Z535, *Safety Alerting Standards,* to make their products and manuals safer. Contractors shall ensure that colors, safety signs and labels, safety symbols, barricade tapes, and information on product manuals, instructions, and collateral materials applying to FAA ELD equipment meet ANSI Z535.1 thru .6 standards.

5.12.2.3 Arc flash hazard labeling
In instances where an arc flash analysis has been completed and updated with any as-built changes, the results of the study shall be labeled on all corresponding equipment, as well as the drawings. Follow NEC Article 110.16 for guidance on warning labels.

Electrical equipment shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before installation of the equipment.

Following the completion of arc flash hazard and shock analyses, the electrical equipment evaluated shall be labeled to include the findings of the analyses. At a minimum, the label shall include the following information: flash hazard boundary; incident energy (calories/cm^2) at appropriate working distances; personal protective equipment (PPE) level - including what fire-retardant clothing is required; shock hazard level (kV); limited approach boundary (feet/inches); restricted approach boundary (feet/inches); class of voltage-rated gloves for restricted approach boundary; prohibited approach boundary (feet/inches); class of voltage-rated gloves for prohibited approach boundary; equipment name; additional PPE required (ear, eye, face, and/or head protection); and date of survey.

5.13 Cable markers

5.13.1 Concrete markers for DEB cable

Concrete markers are required only for direct earth buried (DEB) cables. Install a concrete slab marker at each change of direction of DEB cable, over the ends of ducts or conduits which are installed under paved areas and roadways, and over each splice. Markers shall be two feet (2') square and six inches (6") thick, and shall be installed within 24 hours of the final backfill of the cable trench. The markers shall be installed flat in the ground with the top approximately one

inch (1") above the finished grade. Install slabs so that the side nearest the inscription on top includes an arrow indicating the side nearest the cable. Provide color, type, and depth of warning tape.

Concrete shall have a compressive strength of not less than 20 MPa (3000 psi) and have a smooth, troweled finish on the exposed surface. After the concrete marker has set a minimum of 24 hours, the top surface shall be painted bright orange with paint manufactured specifically for uncured exterior concrete. Markers shall not be installed in concrete or asphalt surfaces.

Each cable marker shall have the following information impressed upon its top surface:

a. The word "CABLE".

b. Name of facility served; for example, "ASR," "VORTAC," "ALS," etc.

c. The designation of the type of cables installed shall be shown on the marker. The type shall be marked with the following abbreviations: "P" for Power, "C" for Control, "T" for Telephone, and "R" for Coaxial (Radio Frequency).

d. An arrow to indicate the direction or change of direction of the cable run.

e. Any additional information as defined by the contract drawings.

f. The contractor shall obtain authorization from the FAA for the information to be impressed on the cable marker and for the method of impression. The letters shall be four inches (4") high, three inches (3") wide and one half inch (1/2") deep.

All cable and cable markers shall be coded with applicable color coding standards, as applicable to the locality. If no standard applies, use the American Public Works Association (APWA) color codes shown in Table VI.

TABLE VI. APWA color codes.

COLOR CODE	TYPE OF UNDERGROUND UTILITY
RED	Electric power lines, cables or conduits, and lighting cables
YELLOW	Gas, oil, steam, petroleum or other hazardous liquid or gaseous materials
ORANGE	Communications, cable TV, alarm or signal lines, cables, or conduits
BLUE	Potable water lines
GREEN	Sewers, storm sewer facilities and utilities, or their drains lines
PURPLE	Reclaimed water, irrigation, or slurry lines
WHITE	Proposed excavation
PINK	Temporary survey marking

The location of the ends of ducts shall be marked with concrete markers 2 feet (2') square and 6 inches (6") thick. The duct markers are to be installed in the same manner as cable markers, except the following shall be impressed upon their top surface:

a. The word, "DUCT".

b. Name of facility served; for example, "ASR," "VORTAC," "ALS," etc.

c. An arrow to indicate the direction or the change in direction of the cable route.

d. The number of conduits and the type of conduits: for example, 4-P/2-C.

e. Any additional information as directed by the FAA project engineer.

DEB cables shall be marked every two hundred feet (200') along a cable run, at each change of direction of the cable, and at each cable splice. Markers shall be either concrete or other type, or a combination of both as specified in the contract documents.

The markers used for DEB cables shall be impressed with a "P" for power cable.

5.13.2 Special-purpose and near-surface markers

Special-purpose and near-surface markers are used to indicate points of additional information. At a minimum, markers shall indicate the location of splices and the entrances of separate duct banks and/or bores. Other significant points may be required as field-determined. Appropriate-colored surface markers shall also be placed where crossing other utilities (for example, blue for water, orange for telephone, yellow for gas). Markers shall be either drilled into existing surfaces (for example, concrete edge of manhole or pavement) or set in a concrete slab square as above.

5.14 Acceptance and inspection procedures

After the installation of cable systems is completed, the FAA and/or its contractor shall perform acceptance/commissioning testing (refer to Appendix C). All safety procedures for energizing the systems following installation shall follow OSHA confined spaces regulations and NFPA 70E. Tests shall be conducted in the operational environment to confirm operational readiness of the ELD and to identify safety hazards involving any component of the ELD system that will support a system in the NAS.

If applicable, participants shall include the FAA project manager, project engineer(s), contract technical representatives, environmental, safety, real estate, power company contracts representative, airport authority representative, and airport staff.

Once acceptance tests are completed and the results accepted, the FAA shall take beneficial occupancy of the ELD system. This may occur in stages.

APPENDIX A—Surge Arrester Performance Data

1. SCOPE

This appendix provides surge arrester performance data for FAA medium-voltage (MV) electrical line distribution (ELD) systems. Surge arresters protect the following ELD system elements:

a. Overhead lines and distribution transformers (utility responsibility),
b. MV transformers and cable installations,
c. MV cables,
d. Internal switchgear and sectionalizers in MV networks,
e. Other ELD-related special-purpose applications as required.

2. APPLICABLE DOCUMENTS

2.1 Non-government publications

Institute of Electrical and Electronics Engineers (IEEE)

IEEE C62.11 (2005; And 1 2008)
Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)

Guide Information for Electrical Equipment, The White Book 2011, and UL Product Categories Correlated to the 2008 and 2011 National Electrical Code®. Surge Arresters 1000 Volts and Higher (VZQK)

National Electrical Manufacturers Association (NEMA)

NEMA LA 1 (1992; R 1999) Standard for Surge Arresters

National Fire Protection Association (NFPA)

NFPA 70 (2008; TIA 08-1) National Electrical Code

NEC article 280: Introduces surge arresters, general requirements, installation requirements, and connection requirements.

3. REQUIREMENTS

3.1 Performance Requirements

3.1.1 General

The requirement is for high-quality metal-oxide surge arresters for use in FAA-owned distribution networks to ensure the protection of underground power cables, low-level distribution transformers, generators, sectionalizing switches, and other electrical equipment. Surge arresters limit dangerous voltage surges caused by lightning strikes or switching anomalies occurring in the ELD network. Arresters also increase the availability of power by reducing outages. Voltage surges can result in personnel injuries from electrical shock, insulation damage to equipment, and possibly fire. Surge arresters provide safe dissipation of these surges.

The standard root-mean-square (rms) maximum continuous operating voltage (MCOV) and rms duty-cycle voltage ratings for typical nominal voltage values and configurations used in FAA underground electrical distribution systems (except note 1) are shown in the table below. Light-duty surge arresters in common use in FAA ELD systems correspond to these configurations.

Nominal Voltage (KVrms)	MCOV (KVrms)	Duty-Cycle (KVrms)
4,160Y (3φ) 2,400 (1φ)	5.1 KV 2.55 kV	6 KV 3 kV
13,200Y(3φ) 7,620 (1φ)	15.3 KV 7.65 kV	18 KV 9 kV
4,160Δ (3φ)(see note 1)	5.1	6 kV
13,800	15.3 kV	18 kV

Note (1): The delta configuration is not a typical FAA ELD configuration. If you encounter this configuration or any configuration not shown above, call the Power Cable Program Office, AJW-22, for guidance.

3.1.2 Placement

Surge arresters shall be provided on the line side of:

1. Pole-mounted transformers (utility responsibility in most cases),

2. Overhead to underground terminal poles (utility),

3. All "normally open" switchways of pad-mounted sectionalizing switches connected to and served from overhead lines, THERE ARE NONE. ELIMINATE? ASK MATT M. AT IMCORP

4. Underground primary metering installations connected to and served from overhead lines.

5. On the line side of any location where a voltage/facility transition occurs.

3.1.3 IEEE Standard C62.11

The design, fabrication, testing, and performance requirement to which a medium voltage surge arrester shall comply is IEEE C62.11 (reference provided above). The definition provided in IEEE C62.11 for metal-oxide surge arresters for ac power circuits greater than 1 kV is:

> **Arrester, distribution, light duty class:** An arrester normally installed on and used to protect underground distribution systems where the major portion of the lightning stroke current is discharged by an arrester located at the overhead line/cable junction.

This class of surge arrester conforms to the minimum recommended level to provide protection against switching and other transient voltages in the underground ELD infrastructure. Light duty class arresters are constrained by the prescribed test requirements of standard IEEE C62.11 (see table below).

Surge arrester test requirements

Class	Rated voltage (kV)		Lightning impulse classifying current (kA)	Minimum High current Short duration withstand (kA)	Minimum Low current Long duration withstand (A, µs)
	Duty cycle	MCOV			
Distribution, light duty	3–36	2.55–29	5	40	75, 2000

3.1.4 Service conditions

An arrester installed in the FAA ELD system shall be capable of successful operations under the service conditions given in the paragraphs below.

3.1.4.1 Usual service conditions

Physical conditions

a) Ambient air temperature in the general vicinity of the arrester shall be between –40°C and +40°C except that: (1) Ambient air temperature in the general vicinity of dead front arresters shall be between –40 °C and +65 °C, and (2) Ambient liquid temperature in the general vicinity of liquid-immersed arresters shall be between –40°C and +95°C.
b) Maximum temperature of the arrester, due to external heat sources in the general vicinity of the arrester, shall not exceed 60°C, except that (1) Maximum temperature of the dead front arrester shall not exceed 85°C, and (2) Maximum temperature of the liquid-immersed arresters shall not exceed 120°C.
c) Altitude shall not exceed 1800 m (6000 ft), except for liquid-immersed arresters.

System conditions

a) Nominal power system frequency of 48 Hz to 62 Hz.
b) System line-to-ground voltage within the ratings of the arrester under all system operating conditions.

3.1.4.2 Unusual service conditions. Exposure to any of the service conditions described in the sections below may require special consideration in the design or application of arresters.

Physical conditions

a) Ambient temperatures in the general vicinity of the arrester exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
b) Maximum arrester temperatures exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
c) Altitude exceeding 1800 m (6000 ft). Arresters for service at higher altitudes shall be suitable for operation at either of the following altitude ranges:
   i) 1801–3600 m (6,001–12,000 ft).
   ii) 3601–5400 m (12,001–18,000 ft).
d) Exposure to any of the following:
   i) Damaging fumes or vapors
   ii) Excessive dirt, salt spray, or other current-conducting deposits.
   iii) Steam.
   iv) Explosive atmospheres, abnormal vibrations, or shocks
e) Limitation on clearances to nearby conducting objects, particularly at altitudes exceeding 1800 m (6000 ft)
f) Unusual transportation or storage.

System conditions

a) Nominal power frequency other than 48 Hz to 62 Hz
b) System operating conditions whereby the ratings of the arrester may be temporarily exceeded. Some examples are as follows:
   i) Loss of neutral ground on normally grounded circuit
   ii) Generator overspeed
   iii) Resonance during faults upon loss of major generation
   iv) System instability
   v) Persistent single line-to-ground fault on ungrounded three-phase systems
c) Any other unusual conditions known to the user.

APPENDIX B—Cable Pulling Calculations

This appendix provides basic information on how to calculate maximum pull force during cable pull operations. For detailed information and more elaborate tables, consult the cable manufacturer. Industry software is readily available to assist with these calculations.

1. To calculate cable pulling force for a cable consisting of several segments, and/or where a cable bends around a curve or a number of curves, calculations are done in incremental segments/steps using formulas and tables, with the segments/steps added together to arrive at the cumulative maximum pull tension. Add an additional 15% margin for safety. To illustrate the cumulative method, an example is given: the pull force calculated for a cable segment A is added to a "bend multiplier" AB, a pull force for straight cable segment B, a pull force for cable segment C, a bend multiplier CD, and a cable segment D, etc., plus 15%.

The basic formula for calculating maximum pulling tension in a single cable section is:

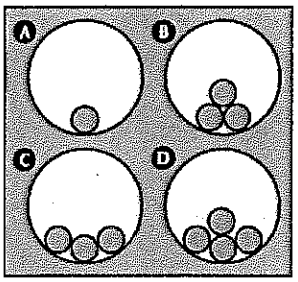
$T = L \times w \times f \times W,$

where
T is the total pulling tension (lb),
L is the length (ft) of cable being pulled,
w is the total weight (lb/ft) of the conductors,
f is the coefficient of friction (usually 0.5 for well-lubricated conditions),
W is the weight correction factor.

2. The process for calculating pull force for a segment of a cable run is as follows:

a. Enter the length of the cable segment in the formula above.
b. Enter the weight of the cable segment.
c. Enter the coefficient of friction.
d. Enter the weight correction factor W, derived as follows:
   i. Determine the geometric position of how the cables will lay in the conduit.
   ii. Calculate W using the table below.
e. Check for jamming hazard of the cables in the conduit.
f. Check sidewall bearing pressure (SWBP).
g. Check headroom.

3. The weight correction factor (W) calculation is based on the cable geometry in the duct:



A = Single; B = Triangular; C = Cradled; D = Diamond

To determine cable geometry, use the ratio of the conduit's inside diameter (D) to the cable's outside diameter (d) to find how the single conductors will sit in the conduit:

Triangular (Fig. B): This occurs when pulling three individual conductors from three separate reels, and their D/d ratio is less than 2.5. If pulling individual triplexed conductors from a single reel, the cables will also sit in this position.

Cradle (Fig. C): This position may occur when pulling three individual conductors from three separate reels, and their D/d ratio is between 2.5 and 3.0. This position is the least favorable because it yields the worst-case scenario of drag during the pull.

Diamond (Fig. D): This position occurs when pulling four individual conductors from four separate reels, and their D/d ratio is less than 3.0. If pulling quadruplexed individual conductors from a single reel, the multiconductor cable will also sit in this position.

No. of Conductors	Position	Weight Factor Equation
1	Single	$W = 1$
3	Triangular	$W = 1 / \{1-[d/(D-d)]^2\}^{1/2}$
3	Cradled	$W = 1 + \{(4/3) \times [d/(D-d)]^2\}$
4	Diamond	$W = 1 + \{2 \times [d/(D-d)]^2\}$
W = Weight correction factor D = Inside diameter of conduit d = Outside diameter of individual conductor		

For the most conservative calculation, use the cradle configuration.

4. Jamming ratio. When sizing the conduit system, installers must consider the possibility of cables jamming or wedging. This usually occurs when three or more individual conductors lie side by side in a single plane. As the conductors are pulled through a bend, the curvature of the bend tends to squeeze the conductors together. Use the following formula to determine the likelihood of jamming. Use the inside diameter of the conduit and the outside diameter of the individual conductor. Avoid jam ratios of 2.8 to 3.2 for Type MV extruded dielectric power cables:

$1.05 \times (D \div d)$

Where
D = the inside diameter of the conduit
d = the outside diameter of an individual conductor.
Constant factor 1.05 = correction for oval shape of bends in the sectional view.

- If the value is less than 2.5, the cable will jam,
- If the value is less than 3.0 but greater than 2.8, jamming is very possible,
- If the value is greater than 3.0, jamming will not occur.
- For medium-voltage extruded dielectric power cables, avoid values between 2.8 to 3.2.

5. Sidewall bearing pressure (SWBP). Sidewall bearing pressure (in pounds per foot) is the tension on the cable coming out of a bend (in pounds) divided by the inside radius of the bend (in feet). When pulling at a bend, the recommended maximum sidewall pressures for 15kV class and less is 500 lb/ft (or less, if recommended by the manufacturer).

No. of Conductors	Position	SWBP Equation
1	Single	SWBP = T ÷ R
3	Cradled	SWBP = [(3W – 2) x T] ÷ 3R
3	Triangular	SWBP = (W x T) ÷ 2R
4	Diamond	SWBP = (W – 1) x (T ÷ R)
W = weight correction factor; T = calculated tension; R = radius of bend (inside radius).		

6. Headroom. To ensure a safe and easy pull, provide clearance between the uppermost conductor and the top of the conduit. For straight pulls, a clearance as small as ¼ in. is considered safe. For more complex pulls, between ½ in. and 1 in. is required. Use the equations below to derive the clearance for a given conduit and cable sitting position. Note that allowance is made for variations in cable and conduit diameters, and the oval shape of the raceway sections at bends.

Configuration	Clearance
Single	$C = D' - d'$
Triangular	$C = \left[\sqrt{D' - 1.366\,d'} + \sqrt{(D' - d')}\right] \times \sqrt{\left[1 - (d' \div D' - d)^2\right]}$
Diamond	$C = \left[(D' - d') - 2d'^2\right] \div (D' - d')$
C = Clearance, D′ = 1.05 x nominal conduit inside diameter; d′ = 1.05 x nominal overall diameter of individual conductor.	

7. Limit pulling tension to 0.008 lb/cmil for copper conductors pulled by pulling eyes or pulling bolts (pulling tension applied directly to the conductor).

8. Limit pulling tension to 1000 lb for jacketed cables pulled by cable grips.

9. Angle of bend. Every time there is a bend in the cable, a bend multiplier factor must be introduced:

Bend Angle	Multiplier
15	1.14
30	1.30
45	1.48
60	1.70
75	1.94
90	2.20
105	2.50
120	2.86

10. For steel, wire, rope, or tape used for cable pulling, a dynamometer graduated to indicate the tension on the cable being pulled can be used, or the contractor shall adapt a rope harness properly sized to limit pull tension to the value indicated. Any combination of a group of cables to be pulled into a duct shall not exceed the sum of individual allowable tension of each cable plus 15 percent.

APPENDIX C—Acceptance testing of newly installed FAA medium voltage underground power cables

This appendix specifies *acceptance testing* of newly installed FAA insulated underground medium voltage power cables rated 2 kV to 15 kV, shielded, non-shielded, and armored. It does not cover *installation testing* or *maintenance testing* as defined in IEEE 400.2. Nor does it cover testing of older, in-service cables. For comprehensive treatment of the maintenance testing of FAA power cables, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables.*

The testing guidance below applies to both direct burial cables and cables installed in nonmetallic and metal conduit. This appendix covers four types of tests used for validating acceptance of FAA medium voltage cables and accessories: (1) a continuity test, (2) an insulation resistance test; (3) an AC VLF field test; and (4) an offline 50/60 Hz partial discharge test. At a minimum, tests one through three (continuity, insulation resistance, and VLF withstand tests) shall be employed as acceptance tests of new FAA cable installations. Test four (offline PD test) is a state-of-the art test that provides the most thorough and exacting test data of all the choices. It can be substituted for the VLF withstand test if funding is available. The test must be conducted by a qualified third-party testing firm that is preapproved by the FAA, and requires extra lead time in planning the test activity (3 months).

Any newly installed cable that fails as a result of cable acceptance testing shall be replaced by the installation contractor at the installation contractor's expense.

The paragraphs that follow detail each test's theory of operation, parameters and tolerances, test schedules, and safety and test procedures. If any conflicts arise relating to power cable testing parameters, procedures, or safety as presented in this appendix, the guidance of FAA Order 6950.22 shall take precedence.

SAFETY REQUIREMENTS, GENERAL

The following are general safety requirements for all electrical power cable acceptance tests. Safety requirements particular to each test are provided in the tests' respective sections that follow.

Before testing is performed, ensure that cables and associated terminations are isolated from electrical apparatus such as power transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular "load break" elbow terminations are used on the cable, ensure that the load break elbows are inserted in the associated isolated parking bushings.

Ensure that all cables and terminations are disconnected and isolated from all sources of power. Using proper high-voltage test instruments, verify that the conductors are not energized and there is no back-feed from some unknown source.

Ensure that all cable shields, equipment grounding conductors, armor, and metallic conduits are properly grounded to the earth electrode system at both ends of the cable to be tested. If present, check to ensure that the cable shield, armor, and equipment grounding conductors are electrically continuous from one end of the cable to the other.

Refer to FAA Order 6950.22, Chapters 1 (Para. 105), 2 (Para. 220, 221, 222), and 5 (Para. 504), as well as applicable IEEE standards for more safety guidance.

1. INSULATION RESISTANCE TEST

1.1 Theory of Operation

After cable system installation and before the cable system is placed in normal service, a "limited voltage" DC insulation resistance test shall be performed and documented, including the testing of terminations and joints.

The insulation resistance test is classified by the IEEE as a diagnostic test. The purpose of the test is not to ensure the cable systems' future performance but simply to assure the construction team that the line is not grounded/shorted before energization. Insulation or dielectric resistance is the resistance to the flow of direct current through or over the surface of the insulating material. Cables are tested by measuring the resistance between conductors, and the resistance between each conductor and ground. For a new cable, or one that is believed to be in very good condition, all of these resistances should measure in megohms (for tolerances, see Section 1.2 of this appendix below).

Any insulation resistance values less than 50 megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations.

The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.2 Parameters and Tolerance limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE").

1.3 Test Schedules

Test after installation and just before energizing the new system.

1.4 Safety and Test Procedure

1.4.1 Safety

Follow safety practices as set forth in Chapter 2 (Para. 221e[2][c]) and 5 (Para. 502, 503) of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to the paragraphs that follow, and IEEE standards, for additional safety and grounding procedures.

Before testing begins, ensure that all associated cable shields, armor, equipment grounding conductors, and metallic conduit are properly grounded at both ends to an approved earth grounding systems or electrode. Verify that the conductors are not energized.

Ensure that cable shields and/or armor are electrically continuous by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only. All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor.

Insulation testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible "backfeed" from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less.***

1.4.2 Test Procedure

Refer to FAA Order 6950.22, Chapter 5, Para. 503 for detailed test procedures. The test procedures cover new cables having either 100% or 133% cable insulation ratings. In instances where the new cable to be tested is joined to an older cable, consult with the FAA project engineer to adjust the testing parameters as needed.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

1.4.2.1 New 2,000 to 5,000 Volt Cables, Terminations, and Joints
Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC Instruments Type 5070 or approved equal) applied incrementally up to the voltage rating of the cable for a duration of not to exceed 5 minutes. Do not exceed the rms line-to-ground voltage across the conductor and metallic shield. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 Megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.4.2.2 New 15,000 Volt Cables, Terminations, and Joints
Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC type 5070 or approved equal) applied incrementally up to 5,000 volts for a duration not to exceed 5 minutes. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 Megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

2. AC VLF FIELD TEST

2.1 Theory of Operation

The AC Very Low Frequency (VLF) (0.1 Hz sinusoidal) field test is essentially a DC Hipot test with a slow voltage oscillation to prevent the buildup of space charge in the cable insulation. The purpose of the test is not to ensure cable system future performance but simply to reassure the construction team that the line is not grounded/shorted before energization. The test is classified

by the IEEE as a destructive test because it is designed to bring a cable and/or accessory to failure where severe defects are present. Thus, the VLF withstand test is a pass/fail test and provides no localization or severity data other than the obvious outward sign of a defect upon failure. Only properly qualified persons who are VLF test-certified may perform this test on FAA ELD systems.

VLF withstand testing is performed after insulation resistance testing. Even if prior insulation resistance testing has indicated that the cable is in good condition, the VLF test may provide a further indication of cable reliability.

Because VLF testing can cause a severe defect in a cable, joints, and/or terminations to fail, provisions should be made to have personnel on-site to find the defective/faulted cable or termination and make the required repairs. Retest the cable after the repairs. Repeat this procedure until cable and terminations pass the VLF test. The installation contractor shall be responsible for repair or replacement of any failed components and retest costs.

2.2 Parameters and Tolerance Limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Also consult IEEE 400.2, *IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF).*

2.3 Test Schedules

Test after installation and just before energizing the new system.

2.4 Safety and Test Procedure

2.4.1 Safety

Follow general safety practices as set forth in Chapters 1, 2, and 5 of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to IEEE 400.2 for safety and grounding procedures, and to the paragraphs below.

VLF testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible "backfeed" from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Before testing is performed, ensure that all cables and associated terminations are disconnected and isolated from all sources of power, including electrical apparatus such as power transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from the electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular load-break elbow terminations are used on the cable, ensure the load-break elbows are inserted in the associated isolated parking bushings. Verify that the conductors are not energized and there is no back-feed from some unknown source.

Properly ground all associated cable shields, armor, equipment grounding conductors, and metallic conduit at both ends to an approved earth grounding systems or electrode. Ensure that cable shields and/or armor are electrically continuous from one end of the cable to the other by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only.

All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor. Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less!!!***

2.4.2 Test Procedure

If the new cable to be tested is joined to an older, in-service cable segment, consult with the FAA project engineer for guidance. The test voltage or other parameters may need to be adjusted for in-service cables because they are more sensitive to the high voltage levels attained during the test. Likewise, consult the FAA project engineer if two cable segments of different voltage ratings are being tested simultaneously, as the lower rated cable could be damaged by high voltage levels used to test the higher rated segment.

VLF testing is not required for cables with rated voltages less than 5,000 volts.

2.4.2.1 5,000 Volt Cables

For new 5,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at not to exceed 14,000 volts (peak) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

2.4.2.2 15,000 Volt Cables

For new 15,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at 28,000 volts (peak) using a VLF test set (High Voltage Inc., type VLF-28CM or approved equal) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

3. OFFLINE 50/60 Hz PARTIAL DISCHARGE TEST

3.1 Theory of Operation

The offline 50/60 Hz partial discharge (PD) test can identify the location and severity of a defect within the new cable or its accessories, including a latent defect missed by hipot tests. The test uses a 50/60 Hz high-voltage power source and sophisticated signal processing/analysis to detect minute partial discharges (PD) in cable insulation, pinpointing manufacturing weaknesses and workmanship errors. It is a reliable method for detecting defects inadvertently missed during factory tests, defects introduced during transportation and installation, and flaws introduced while handling and splicing the cables. These defects frequently do not appear in normal voltage withstand tests but can eventually cause undesirable service failures weeks, months, or years into the future.

The test is classified by the IEEE as a diagnostic test and not a destructive test (i.e., it is not designed to cause cable and accessories to fail). Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm must be a qualified contractor preauthorized by the FAA.

3.2 Parameters and Tolerance Limits

The test is conducted in accordance with IEEE 400.3 using a maximum test voltage of 2.0 to 2.5 times operating voltage level (Uo) for a duration not to exceed 30 seconds.

For test parameters and tolerance limits, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 3, Standards and Tolerances, Paragraph 301, Table (see column heading labeled "NEW CABLE").

3.3 Test Schedules

Test after installation and just before energizing the new system. Allow adequate lead time for test planning with the third party testing firm: about 3 months before project completion for the initial notice, followed by 8 weeks' advance notice for setting up the information-gathering and detailed planning sessions.

3.4 Safety and Test Procedure

3.4.1 Safety

The third-party testing firm shall provide safety briefings at the beginning of each test session. See FAA Order 6950.22, Chapter 5, paragraph 504e(1) and applicable IEEE safety standards.

3.4.2 Test Procedure

For test procedure details, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 5, Paragraph 504.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

APPENDIX D—Acronyms/glossary

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current Advisory Circular
AJW-22	FAA Power Services Group
ALS	Approach Lighting Systems
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASR	Air Surveillance Radar
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge. A standard for expressing wire diameter. As the AWG number gets smaller, the wire diameter gets larger.
C	Clearance (cable pulling)
°C	Degrees Centigrade
CADD	Computer-Aided Design and Drafting
cmil	Circular Mil(s). Area of a wire that is one-thousandth of an inch (.001 inch, one mil) in diameter.
CN	Concentric Neutral
CONUS	Continental United States
CT	Current Transformer
d	Cable Outside Diameter (cable pulling)
D	Conduit Inside Diameter (cable pulling)
D'	D x 1.05 (cable pulling)
DC	Direct Current
DEB	Direct Earth Buried
DLA	Defense Logistics Agency
DOD	Department of Defense
Duct Bank	A set of parallel conduits made of steel, PVC covered, steel, heavy-walled PVC, or thin-walled PVC in reinforced concrete. Duct banks terminate in utility access holes or vaults. If not enclosed in concrete, duct banks must be of thicker material than thin-walled PVC.
EES	Earth Electrode System
ELD	Electrical Line Distribution (System). An underground or overhead electrical distribution system running from a power source to FAA facility load(s). An ELD may include some or all of the following: power cable; transformers; sectionalizers; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Intra-facility wiring, runway edge lighting cables, and FOTS and system cables, such as MALSR or ALSF loop cables are not included as part of ELD.
Electrical Trees	Tree-like growths consisting of non-solid or carbonized microchannels, which can occur at electric field enhancements such as protrusions, contaminants, voids, or water trees subjected to electrical stress for extended time periods. Partial discharges are responsible for electrical tree growth.
EPT	Electrical PVC Tubing

EPC	Electrical PVC Conduit
f	Coefficient of Friction (cable pulling)
FAA	Federal Aviation Administration
FOTS	Fiber Optic Telecommunications System(s)
ft	Feet
GIS	Geographic Information Systems
GPS	Global Positioning System
Grounding Conductor	A conductor used to connect equipment or the grounded circuit of a wiring system to the grounding electrode system.
Grounding Electrode	Copper rod, plate, or wire embedded in the ground for the specific purpose of dissipating electrical energy to the earth.
HAZMAT	Hazardous Materials
HDBK	FAA Handbook
HDPE	High-Density Polyethylene
HH	Hand Hole
HIPOT	High Potential (Test)
Hz	Hertz
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IECA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
in.	Inch(es)
ISO	International Standards Organization
JO	FAA Order
kg	Kilogram(s)
kV	Kilovolt(s)
L	Length of Cable (cable pulling)
lb	Pound(s)
LV	Low Voltage (Typically 600V and Below for ELD Systems)
m	Meter(s)
MCOV	Maximum Continuous Operating Voltage
MH	Manhole
mH	Millihenry(s)
MIL-STD	Military Standard
MIL-I	Military Specification
mil	Unit of Length, Equal to One Thousandth (10^{-3}) of an Inch (0.0254 millimeter)
mm	Millimeter
MOV	Metal Oxide Varistor
MV	Medium Voltage (600 V to 37.5 kV)
NAS	National Airspace System
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code

NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
OPR	Office of Primary Responsibility
OSHA	Occupational Safety and Health Administration
Pa	Pascal(s)
pC	Picocoulomb(s)
PD	Partial Discharge
PPE	Personal Protective Equipment
psi	Pounds per Square Inch
PSG	Power Services Group
PTFE	Polytetrafluoroethylene (Teflon™)
PVC	Polyvinyl Chloride
PWRFRQ	Power Frequency (Test)
Qualified Person (Electrical)	A person knowledgeable in the construction and operation of electric power generation, transmission, and/or distribution equipment, along with associated hazards. Also known as "qualified worker."
R	Radius of Bend (cable pulling)
rms	Root Mean Square
RMC	Rigid Metal Conduit
RSA	Runway Safety Area. Areas of a runway established to enhance safety in the event of an aircraft undershoot, overrun, or excursion from the side of the runway.
SDR	Standard Dimensional Ratio
SPD	Surge Protection Device
STD	FAA Standard
SWBP	Sidewall Bearing Pressure (cable pulling)
T	Total Pulling Tension (cable pulling)
TR-XLPE	Tree-retardant XLPE
TSA	Taxiway Service Area
U_o	Operating Voltage, Line to Ground
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specification (DOD). The UFGS was founded by the Secretary of Defense and mandated by the Department of Defense for all Military Services to unify their specifications into one database.
UL	Underwriters' Laboratory
UV	Ultraviolet
V	Volt(s)
VLF	Very Low Frequency
VORTAC	VOR/Tactical Air Navigation
w	Weight of Conductors (cable pulling)
W	Weight correction factor (cable pulling)
Xfmr	Transformer
XLPE	Cross-Linked Polyethylene

APPENDIX E--Submittals Matrix

Contractor-generated design data	
• Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2)	A Required.
• Design assumptions and parameters (FAA-STD-032)	B ☐ Required for this project (check block).
• Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc)	C ☐ Required for this project.
• Design calculations (FAA-STD-032)	A Required.
• Contractor-generated design drawings or sketches.	A Required.
Cost estimates	A Required.
Medium voltage cable	A Required.
Medium voltage cable splices and joints*	A Required.
Medium voltage cable terminations*	A Required.
Conduits	A Required.
Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc)	A Required.
Switch pads and sectionalizers	A Required.
Transfer switches (automatic and manual)	A Required.
Transformers	A Required.
Surge arresters	A Required.
Live end caps or protective caps	A Required.
Precast concrete structures	A Required.
Sealing Material	B ☐ Required for this project.
Manhole frames and covers	A Required.
Hand hole frames and covers	A Required.
Cable supports (racks, arms and insulators)	A Required.
Protective devices and coordination study	A Required.
As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system.	A Required.

Electrical equipment factory test reports		
Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13).	A	Required.
Transformers	A	Required.
Switchgear, sectionalizers	A	Required.
Disconnects	A	Required.
Other components	B ☐	Required for this project.
Field acceptance checks and tests (see Appendix C)	A	Required.
Arc-proofing test for cable fireproofing tape	C ☐	Required for this project.
Cable installation plan and procedure		
• Site layout drawing with cable pulls numerically identified	B ☐	Required for this project.
• list of equipment used, with calibration certifications	A	Required.
• The manufacturer, type, and quantity of lubricant used on pull	B ☐	Required for this project.
• The cable manufacturer and type of cable	A	Required.
• The dates of cable pulls, time of day, and ambient temperature	C ☐	Required for this project.
• The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table of cable pulls may be submitted.	A	Required.
• The actual cable pulling tensions encountered during pull	A	Required.
• Certificates (tensiometer calibration, VLF tester calibration, etc) [A]	A	Required.
Cable splicer/terminator qualifications* [A]	A	Required.
Cable installer qualifications* [A]	A	Required.
Project design drawings [A]	A	Required.

APPENDIX F—HDPE-to-HDPE and HDPE-to-PVC Conduit Adhesive - Sample Product



American Polywater's

BONDS to Polyethylene, PVC, Fiberglass, Metals and more

BonDuit® Conduit Adhesive is a unique two-part adhesive system used to transition-splice conduits (innerducts) of different types. BonDuit® Adhesive in 5 minutes makes a strong, durable splice that is air/water tight. Requires no expensive equipment.

Estimated Load Capacity and Usage

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ¾ inch	760 lbs.
1 ¼ inch	2 ¾ inch	1,140 lbs.
2 inch	2 ½ inch	1,520 lbs.
4 inch	3 ¾ inch	4,560 lbs.

Results are based on careful surface preparation and a 24-hour cure at 70° F. Under these cure conditions; the load will reach 50% capacity after one hour and fully cured in 24 hours. To create air-tight joints for air-assisted cable installation, a cure time of 2 hours at 70°F is recommended. BonDuit® Conduit Adhesive is not designed for high stress pulls, such as those in HDD installations.

Numbers of Applications

BonDuit® Conduit Adhesive kit contain the materials necessary to prepare plastic and metal surfaces for bonding. By following the instructions, a strong joint takes just minutes. Each cartridge contains enough material for numerous applications, depending on the size of each coupling or joint.

Conduit Size	Applications per Cartridge
1 inch	20-30
1 ¼ inch	12-18
2 inch	10-15
4 inch	4-6

Drawing No.	Title
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item FAA-C-13191d	Installation, Termination, Splicing, And Transient/Surge Protection Of Underground Electrical Distribution System Power Cables
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT

1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

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ADDENDUM TO IFB

IFB Number: IFB 17-024/JW

IFB Title: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

IFB Due: **11:00 am CDT, Tuesday, August 8, 2017**

Addendum No.: 3

Issued (Date): August 4, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Extending the Construction Schedule, and Changing the Method of Measurement for P-152 Material.

- **Extending the Construction Schedule**

The construction schedule has been extended from 274 calendar days to 359 calendar days. Please find attached the updated Construction Safety and Phasing sheets from the construction drawings reflecting the new phase durations. The project manual has also been edited to reflect the new schedule. The following project manual sections reference the construction duration and have therefore been updated and included in this addendum: The Template Notice to Proceed; The Bid Form; The Contract.

- **Changing the Method of Measurement for P-152 Material**

Borrow material – governed by the P-152 specification – shall no longer be measured for payment in its original position at the borrow pit. Instead, it shall be paid for based on plan quantities as stated in the amended and attached P-152 specification.

Addendum No. 3 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

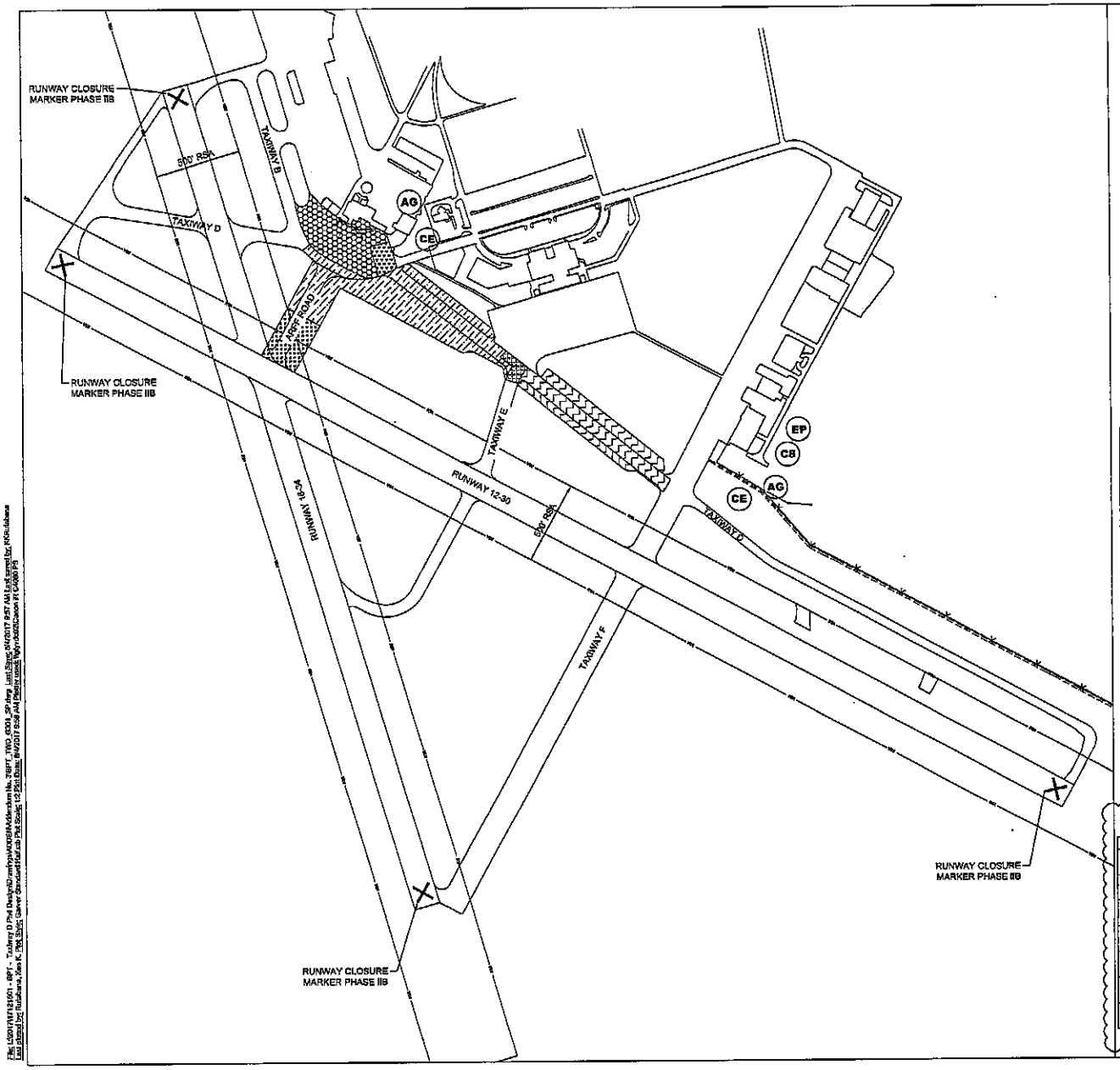
Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)
T.W. HARRISON
PRESIDENT
Title of Person Signing Above

ALLCO
Typed Name of Business or Individual

PO BOX 3684, BEAUMONT, TX 77704
Address



N

0 150' 300' 600' 900'
(IN FEET)

LEGEND

AG	ACCESS GATE
CS	CONTRACTOR'S STAGING
EP	CONTRACTOR'S EMPLOYEE PARKING
CE	CONTRACTOR'S ENTRANCE

ITEMS OF WORK

PHASE	DESCRIPTION
IA	RECONSTRUCT TAXIWAY 'D' PAVEMENT, REMARK TAXIWAY 'D' PAVEMENT, AND REMOVE AND INSTALL LIGHTING IMPROVEMENTS. CLEAN AND SEAL TAXIWAY 'D' PAVEMENT.
IB	CLEAN AND SEAL TAXIWAY 'D' PAVEMENT.
IIA	REALIGN AND RECONSTRUCT TAXIWAY 'D' PAVEMENT, REMARK TAXIWAY 'D' PAVEMENT, AND REMOVE AND INSTALL LIGHTING IMPROVEMENTS, CONSTRUCT SPLIT DUCT ENCASEMENT OF EXISTING FAA COMMUNICATIONS CABLE, PARTIAL APRON RECONSTRUCTION, NARROW AND SEAL COAT THE ARFF ROAD OUTSIDE OF RUNWAYS RSA, INSTALL NEW PRIMARY WIND CONE.
IIB	NARROW AND SEAL COAT THE ARFF ROAD WITHIN RSA LIMITS.
IIIA	APRON PAVEMENT SEAL COAT LIMITS 1
IIIB	APRON PAVEMENT SEAL COAT LIMITS 2

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
MOBILIZATION (25 DAYS)		ANYTIME
PHASE IA (180 DAYS)		ANYTIME
PHASE IB (2 DAYS)		OVERNIGHT ONLY
PHASE IIA (180 DAYS)		ANYTIME
PHASE IIB (2 DAYS)		OVERNIGHT ONLY
PHASE IIIA (5 DAYS)		OVERNIGHT ONLY
PHASE IIIB (5 DAYS)		WEEKEND ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS
BRANDON C. BEVILLE
121604
LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
3	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

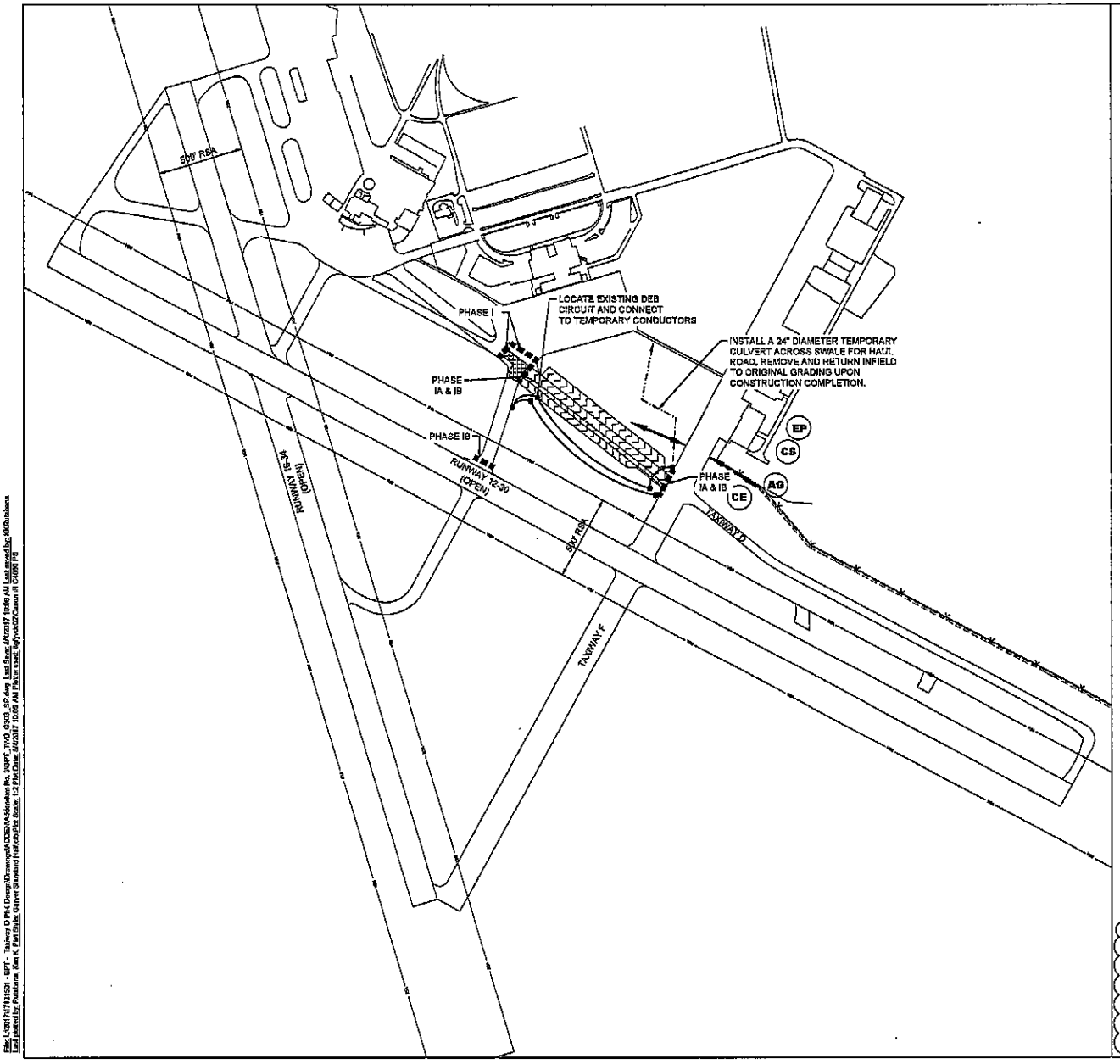
SAFETY AND PHASING PLAN

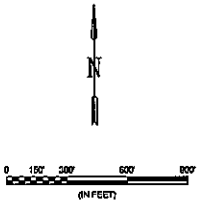
JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDO
DRAWN BY: JS

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

DRAWING NUMBER
G-301

SHEET NUMBER 5





PHASE I NOTES

1. PLACE LOW PROFILE AIRCRAFT BARRICADES AS INDICATED (SEE DETAIL ON SHEET G-302).
2. RECONSTRUCT AND REALIGN TAXIWAY 'D' PAVEMENT WITHIN PHASE I WORK LIMITS.
3. REMARK TAXIWAY 'D' PAVEMENT WITHIN PHASE I WORK LIMITS.
4. REMOVE EXISTING TAXIWAY EDGE LIGHTING AND INSTALL LIGHTING IMPROVEMENTS ALONG TAXIWAY 'D' WITHIN PHASE I WORK LIMITS.
5. REMOVE LOW PROFILE AIRCRAFT BARRICADES WHEN PHASE I IS COMPLETED.
6. JOINT CLEAN AND SEAL TAXIWAY 'D' AT TAXIWAY 'E' INTERSECTION WHEN JOINT SEALING NEW TAXIWAY 'D' PAVEMENT.

LEGEND

- PHASE IA CONSTRUCTION AREA
- PHASE IB CONSTRUCTION AREA
- CONTRACTORS ACCESS/HAUL ROUTE
- FENCE
- PERIMETER ROAD
- LOW PROFILE AIRCRAFT BARRICADES (SEE SHEET G-302 FOR DETAILS)
- EXISTING DITCH
- (AG) ACCESS GATE
- (CS) CONTRACTOR'S STAGING
- (EP) CONTRACTOR'S EMPLOYEE PARKING
- (CE) CONTRACTOR'S ENTRANCE
- ELECTRICAL JUMPER CONNECTION

GENERAL NOTES:

1. ALL EQUIPMENT AND PERSONNEL MUST REMAIN OUT OF THE RUNWAY SAFETY AREA WHILE THE RUNWAY IS ACTIVE.
2. SEE SHEET G-302 FOR SAFETY AND PHASING DETAILS.
3. SEE SHEET E-313 FOR TEMPORARY ELECTRICAL CONNECTION DETAILS.
4. CONTRACTOR'S ACCESS ROUTE PASSES THROUGH AN ACTIVE AIRCRAFT MOVEMENT AREA. CONTRACTOR TO PROVIDE FLAGMEN AND GUIDE VEHICLE FOR CONSTRUCTION TRAFFIC CROSSING THE ACTIVE AIRCRAFT MOVEMENT AREA. THE ACCESS ROUTE FROM THE CONTRACTOR'S STAGING AND STORAGE AREA TO THE WORK SITE WILL BE CONTINUOUSLY MONITORED FOR DEBRIS AND CLEANED IMMEDIATELY.
5. LOCATE TEMPORARY ELECTRICAL JUMPERS ADJACENT TO LOW PROFILE BARRICADES WHERE POSSIBLE. ⚠

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
MOBILIZATION (25 DAYS)		ANYTIME
PHASE IA (150 DAYS)		ANYTIME
PHASE IB (2 DAYS)		OVERNIGHT ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS — BRANDON C. SEVILLE — 121604 — REGISTERED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 06/04/2017

REV	DATE	DESCRIPTION	BY
⚠	06/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING - PHASE I

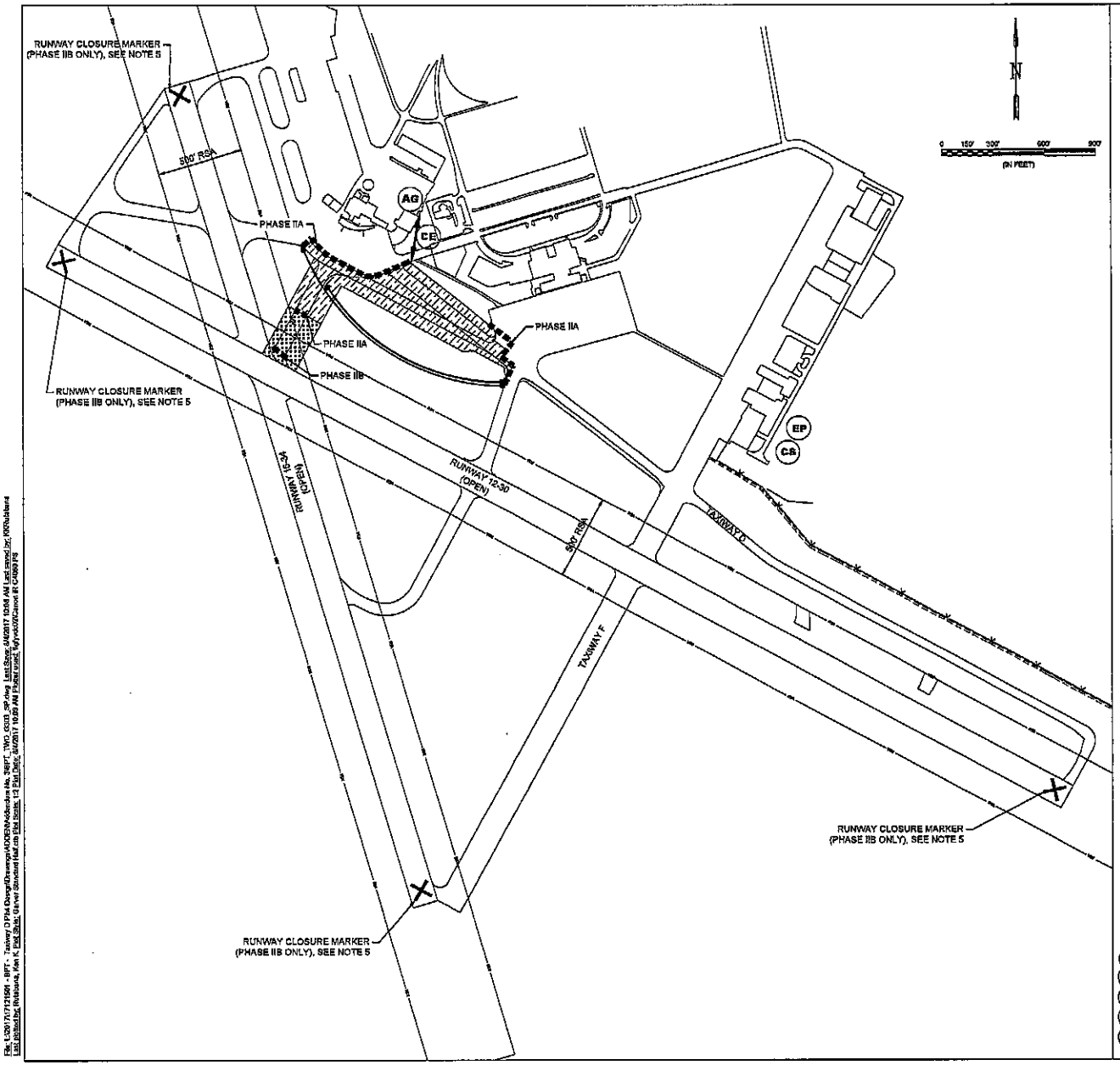
JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

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DRAWING NUMBER G-303

SHEET NUMBER 7

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PHASE II NOTES

1. PLACE LOW PROFILE AIRCRAFT BARRICADES AS INDICATED (SEE DETAIL ON SHEET G-302).
2. RECONSTRUCT AND REALIGN TAXIWAY 'D' PAVEMENT WITHIN PHASE II WORK LIMITS.
3. REMARK TAXIWAY 'D' PAVEMENT WITHIN PHASE II WORK LIMITS.
4. REMOVE AND INSTALL LIGHTING IMPROVEMENTS ALONG TAXIWAY 'D' WITHIN PHASE II WORK LIMITS.
5. CONSTRUCT SPLIT DUCT ENCASEMENT OF FAA CABLES.
6. ADJUST FAA MANHOLE TO NEW GRADE.
7. PARTIALLY RECONSTRUCT AND REHABILITATE APRON WITHIN PHASE II WORK LIMITS.
8. MILL TAXIWAY 'C' OUTER PAVEMENT SECTIONS.
9. REMOVE LOW PROFILE AIRCRAFT BARRICADES WHEN PHASE II IS COMPLETED.

LEGEND

- PHASE IIA CONSTRUCTION AREA
- PHASE IIB CONSTRUCTION AREA
- CONTRACTORS ACCESS/HAUL ROUTE
- FENCE
- PERIMETER ROAD
- LOW PROFILE AIRCRAFT BARRICADES (SEE SHEET G-302 FOR DETAILS)
- EXISTING DITCH
- (AG) ACCESS GATE
- (CS) CONTRACTOR'S STAGING
- (EP) CONTRACTOR'S EMPLOYEE PARKING
- (CE) CONTRACTOR'S ENTRANCE
- ELECTRICAL JUMPER CONNECTION
- LIGHTED RUNWAY CLOSURE MARKER

GENERAL NOTES:

1. ALL EQUIPMENT AND PERSONNEL MUST REMAIN OUT OF THE RUNWAY SAFETY AREA WHILE THE RUNWAY IS ACTIVE.
2. SEE SHEET G-302 FOR SAFETY AND PHASING DETAILS.
3. SEE SHEET E-313 FOR TEMPORARY ELECTRICAL CONNECTION DETAILS.
4. CONTRACTOR'S ACCESS ROUTE PASSES THROUGH AN ACTIVE AIRCRAFT MOVEMENT AREA. CONTRACTOR TO PROVIDE FLAGMEN AND GUIDE VEHICLE FOR CONSTRUCTION TRAFFIC CROSSING THE ACTIVE AIRCRAFT MOVEMENT AREA. THE ACCESS ROUTE FROM THE CONTRACTOR'S STAGING AND STORAGE AREA TO THE WORK SITE WILL BE CONTINUOUSLY MONITORED FOR DEBRIS AND CLEANED IMMEDIATELY.
5. FOR RUNWAY CLOSURES BETWEEN THE HOURS OF 2200 AND 0600 DAILY, CONTRACTOR WILL BE REQUIRED TO POSITION LIGHTED RUNWAY CLOSURE MARKERS AS SHOWN ON THE PLANS. MARKERS WILL BE REMOVED PRIOR TO RETURNING THE RUNWAY TO SERVICE. A DAY WILL BE MEASURED BY EACH 24 HOUR PERIOD THE MARKER IS IN USE FOR A CLOSURE.
6. LOCATE TEMPORARY ELECTRICAL JUMPERS ADJACENT TO LOW PROFILE BARRICADES WHERE POSSIBLE.

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
PHASE IIA (180 DAYS)		ANYTIME
PHASE IIB (2 DAYS)		OVERNIGHT ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-6713

BRANDON C. BEVILLE 121604 LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
1	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING - PHASE II

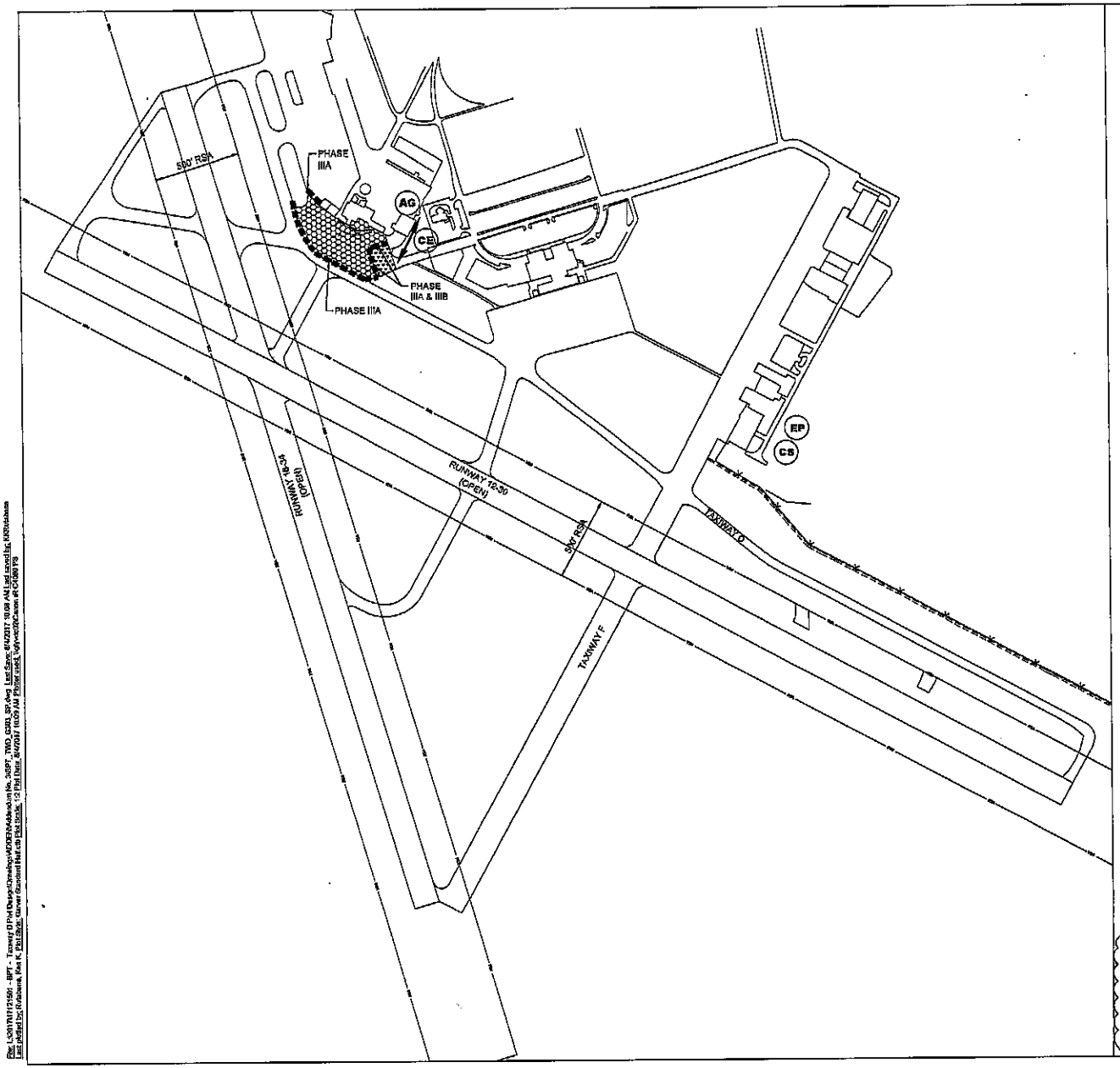
JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

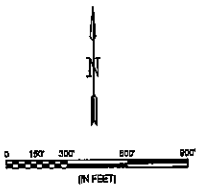
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DRAWING NUMBER
G-304

SHEET NUMBER 8

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PHASE III NOTES

1. PLACE LOW PROFILE AIRCRAFT BARRICADES AS INDICATED (SEE DETAIL ON SHEET G-302).
2. REHABILITATE WARE RAMP WITHIN PHASE III WORK LIMITS
3. REMARK WARE RAMP PAVEMENT WITHIN PHASE III WORK LIMITS.
4. REMOVE LOW PROFILE AIRCRAFT BARRICADES WHEN PHASE III IS COMPLETED.

LEGEND

- PHASE IIIA CONSTRUCTION AREA
- PHASE IIIB CONSTRUCTION AREA
- CONTRACTORS ACCESS/HAUL ROUTE
- FENCE
- PERIMETER ROAD
- LOW PROFILE AIRCRAFT BARRICADES (SEE SHEET G-302 FOR DETAILS)
- EXISTING DITCH
- (AG) ACCESS GATE
- (CS) CONTRACTOR'S STAGING
- (EP) CONTRACTOR'S EMPLOYEE PARKING
- (CE) CONTRACTOR'S ENTRANCE

GENERAL NOTES:

1. ALL EQUIPMENT AND PERSONNEL MUST REMAIN OUT OF THE RUNWAY SAFETY AREA WHILE THE RUNWAY IS ACTIVE.
2. SEE SHEET G-302 FOR SAFETY AND PHASING DETAILS.
3. CONTRACTOR'S ACCESS ROUTE PASSES THROUGH AN ACTIVE AIRCRAFT MOVEMENT AREA. CONTRACTOR TO PROVIDE FLAGMEN AND GUIDE VEHICLE FOR CONSTRUCTION TRAFFIC CROSSING THE ACTIVE AIRCRAFT MOVEMENT AREA. THE ACCESS ROUTE FROM THE CONTRACTOR'S STAGING AND STORAGE AREA TO THE WORK SITE WILL BE CONTINUOUSLY MONITORED FOR DEBRIS AND CLEANED IMMEDIATELY.

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
PHASE IIIA (5 DAYS)	1	OVERNIGHT ONLY
PHASE IIIB (5 DAYS)	1	WEEKEND ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

BRANDON C. BEVILLE 121604 LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
3	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING - PHASE III

JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

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DRAWING NUMBER G-305

SHEET NUMBER 9

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XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 359 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

~~As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXXX, 2017.~~

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Colin M. Bible, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
SS-120-1	SITE PREPARATION	L.S.	1	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$	$
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$	$

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
P-155-2	LIME	TON	600	$_____	$_____

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$ _____	$ _____

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____/100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
T-904-1	SODDING	S.Y.	1,405	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$_____	$_____
	Unit price in words: _____ dollars and _____/100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$_____	$_____

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: _____ dollars and _____ /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
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BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700		

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				

TOTAL (BASE BID) $_____

Total price in words: _____ dollars and _____ /100

It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Three-Hundred and Fifty-Nine (359)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions*. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective Grading. When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3~~. *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* ~~will~~ be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557.** The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of **2** coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed] [The quantity of compacted embankment in place to be paid for shall be the number of cubic yards measured in its final position.~~

Measurement of excavation/embankment shall be based on ***plan quantities****. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards ~~measured in its original position at the borrow pit~~ *as based on plan quantities.*

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

Brandon Harrison

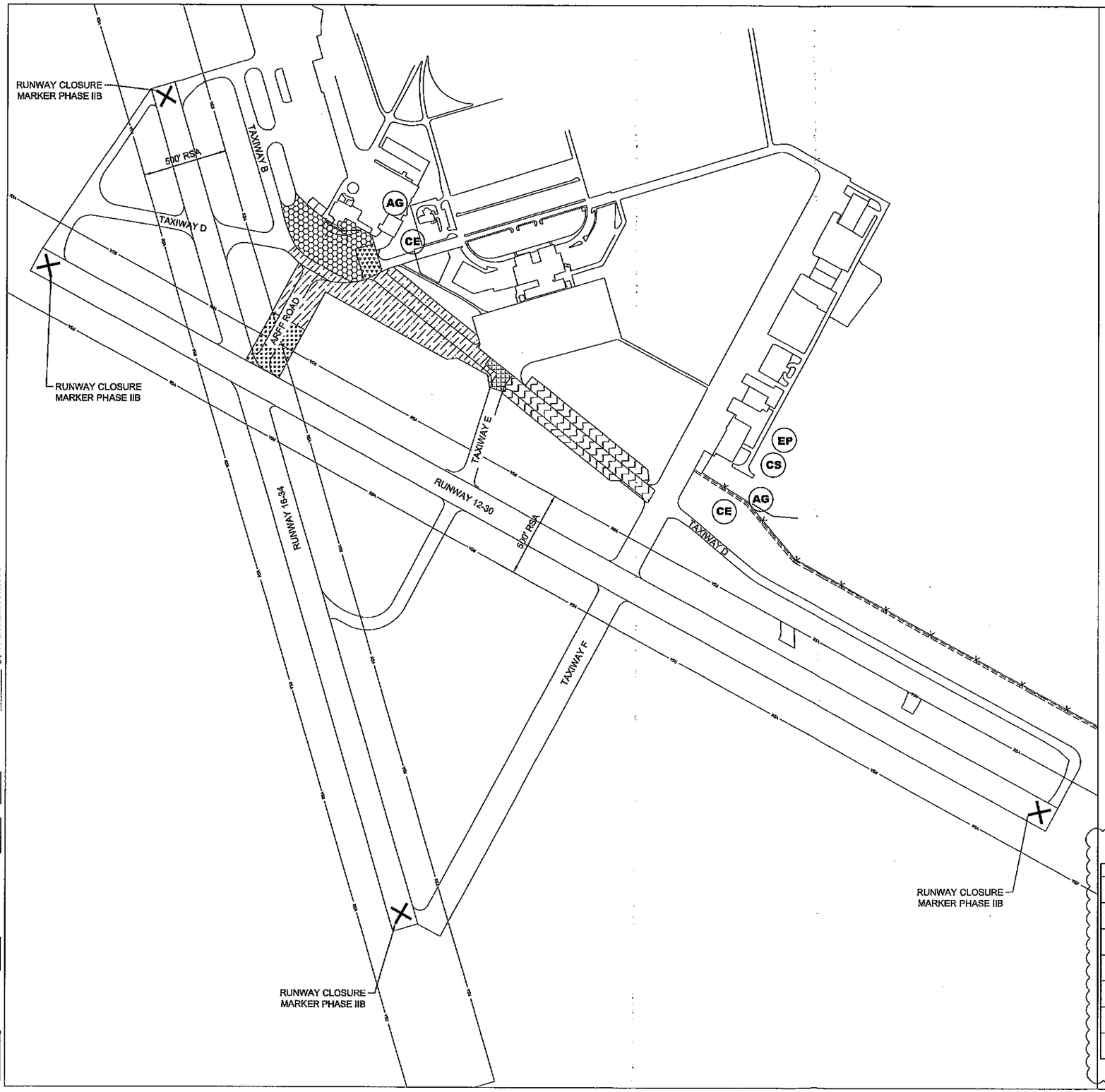
n:	SOTELO Armando
Sent:	Friday, August 4, 2017 2:04 PM
To:	Brandon Harrison
Cc:	SULAK Chrystal
Subject:	Re: Jack Brooks Airport Taxiway Reconstruction 2017

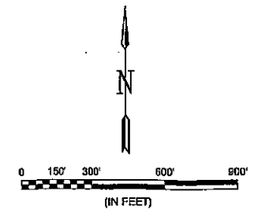
$195/ton for type A hydrate slurry to meet spec p155

Armando Sotelo
Lhoist North America
Cell 713-203-9517

On Aug 4, 2017, at 1:15 PM, Brandon Harrison <bharrison@allco.com> wrote:

> Armando,
>
> Please provide pricing for 600 tons of lime slurry per P-155.
>
> **Thanks,**
>
> **Brandon Harrison**
>
> ALLCO
>
> **P.O. Box 3684**
> **Beaumont, TX 77704**
> **Office: 409-860-4459**
> **Fax: 409-860-3857**





LEGEND

AG	ACCESS GATE
CS	CONTRACTOR'S STAGING
EP	CONTRACTOR'S EMPLOYEE PARKING
CE	CONTRACTOR'S ENTRANCE

ITEMS OF WORK

PHASE	DESCRIPTION
IA	RECONSTRUCT TAXIWAY 'D' PAVEMENT, REMARK TAXIWAY 'D' PAVEMENT, AND REMOVE AND INSTALL LIGHTING IMPROVEMENTS. CLEAN AND SEAL TAXIWAY 'D' PAVEMENT.
IB	CLEAN AND SEAL TAXIWAY 'D' PAVEMENT.
IIA	REALIGN AND RECONSTRUCT TAXIWAY 'D' PAVEMENT, REMARK TAXIWAY 'D' PAVEMENT, AND REMOVE AND INSTALL LIGHTING IMPROVEMENTS. CONSTRUCT SPLIT DUCT ENCASEMENT OF EXISTING FAA COMMUNICATIONS CABLE. PARTIAL APRON RECONSTRUCTION. NARROW AND SEAL COAT THE ARFF ROAD OUTSIDE OF RUNWAYS RSA. INSTALL NEW PRIMARY WIND CONE.
IIB	NARROW AND SEAL COAT THE ARFF ROAD WITHIN RSA LIMITS.
IIIA	APRON PAVEMENT SEAL COAT LIMITS 1
IIIB	APRON PAVEMENT SEAL COAT LIMITS 2

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
MOBILIZATION (25 DAYS)		ANYTIME
PHASE IA (160 DAYS)		ANYTIME
PHASE IB (2 DAYS)		OVERNIGHT ONLY
PHASE IIA (160 DAYS)		ANYTIME
PHASE IIB (2 DAYS)		OVERNIGHT ONLY
PHASE IIIA (5 DAYS)		OVERNIGHT ONLY
PHASE IIIB (5 DAYS)		WEEKEND ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS
BRANDON C. BEVILLE
121604
LICENSED
PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
1	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING PLAN

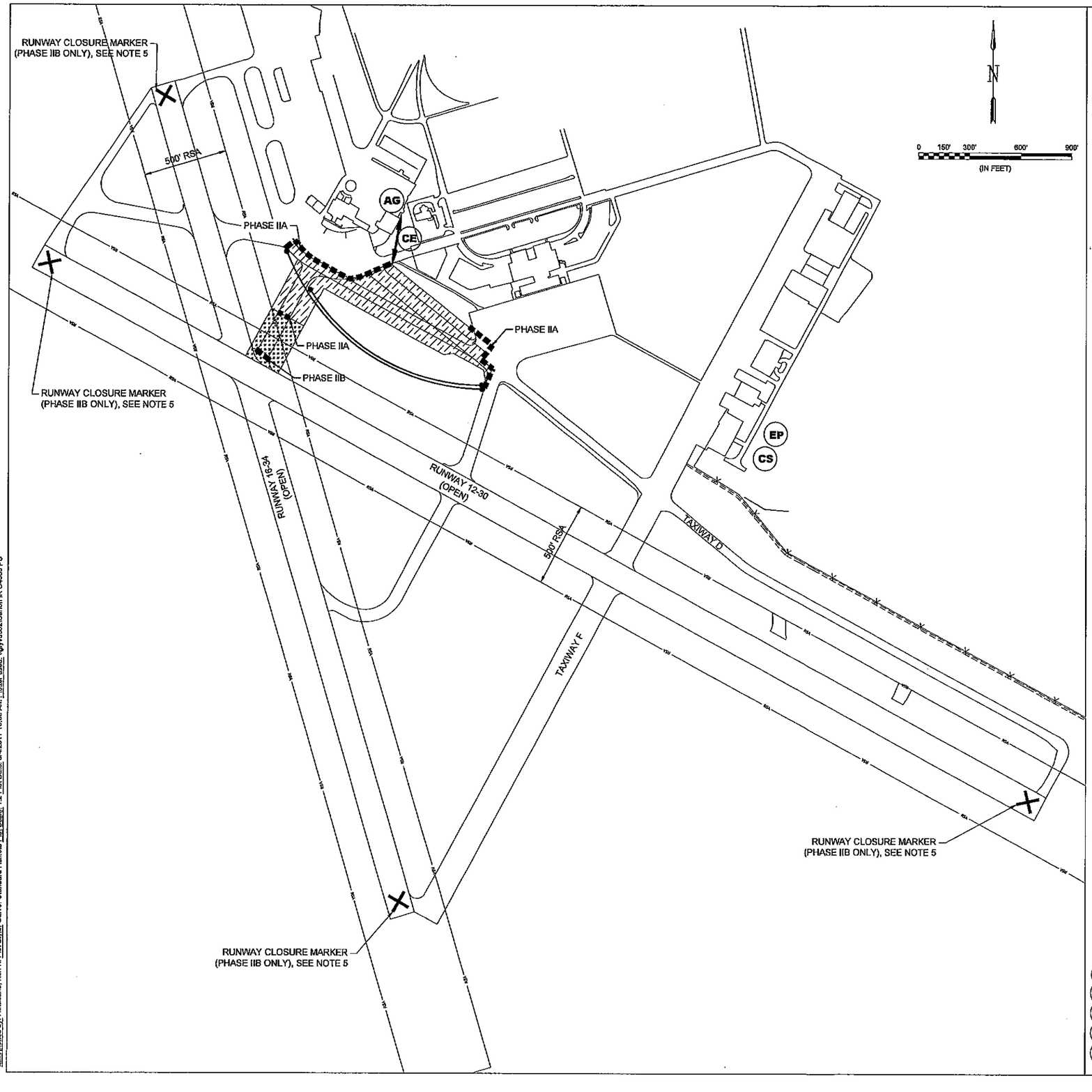
JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

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DRAWING NUMBER
G-301

SHEET NUMBER **5**

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Last Plotted by: Rutabana, Ken K. Plot Style: Garver Standard Half.ctb Plot Scale: 1:2 Plot Date: 8/4/2017 9:58 AM Plotter Used: \\plyvdc02\Canon IR C4080 PS



PHASE II NOTES

1. PLACE LOW PROFILE AIRCRAFT BARRICADES AS INDICATED (SEE DETAIL ON SHEET G-302).
2. RECONSTRUCT AND REALIGN TAXIWAY 'D' PAVEMENT WITHIN PHASE II WORK LIMITS.
3. REMARK TAXIWAY 'D' PAVEMENT WITHIN PHASE II WORK LIMITS.
4. REMOVE AND INSTALL LIGHTING IMPROVEMENTS ALONG TAXIWAY 'D' WITHIN PHASE II WORK LIMITS.
5. CONSTRUCT SPLIT DUCT ENCASEMENT OF FAA CABLES.
6. ADJUST FAA MANHOLE TO NEW GRADE.
7. PARTIALLY RECONSTRUCT AND REHABILITATE APRON WITHIN PHASE II WORK LIMITS.
8. MILL TAXIWAY 'C' OUTER PAVEMENT SECTIONS.
9. REMOVE LOW PROFILE AIRCRAFT BARRICADES WHEN PHASE II IS COMPLETED.

LEGEND

- PHASE IIA CONSTRUCTION AREA
- PHASE IIB CONSTRUCTION AREA
- CONTRACTORS ACCESS/HAUL ROUTE
- FENCE
- PERIMETER ROAD
- LOW PROFILE AIRCRAFT BARRICADES (SEE SHEET G-302 FOR DETAILS)
- EXISTING DITCH
- (AG) ACCESS GATE
- (CS) CONTRACTOR'S STAGING
- (EP) CONTRACTOR'S EMPLOYEE PARKING
- (CE) CONTRACTOR'S ENTRANCE
- ELECTRICAL JUMPER CONNECTION
- LIGHTED RUNWAY CLOSURE MARKER

GENERAL NOTES:

1. ALL EQUIPMENT AND PERSONNEL MUST REMAIN OUT OF THE RUNWAY SAFETY AREA WHILE THE RUNWAY IS ACTIVE.
2. SEE SHEET G-302 FOR SAFETY AND PHASING DETAILS.
3. SEE SHEET E-313 FOR TEMPORARY ELECTRICAL CONNECTION DETAILS.
4. CONTRACTOR'S ACCESS ROUTE PASSES THROUGH AN ACTIVE AIRCRAFT MOVEMENT AREA. CONTRACTOR TO PROVIDE FLAGMEN AND GUIDE VEHICLE FOR CONSTRUCTION TRAFFIC CROSSING THE ACTIVE AIRCRAFT MOVEMENT AREA. THE ACCESS ROUTE FROM THE CONTRACTOR'S STAGING AND STORAGE AREA TO THE WORK SITE WILL BE CONTINUOUSLY MONITORED FOR DEBRIS AND CLEANED IMMEDIATELY.
5. FOR RUNWAY CLOSURES BETWEEN THE HOURS OF 2200 AND 0600 DAILY, CONTRACTOR WILL BE REQUIRED TO POSITION LIGHTED RUNWAY CLOSURE MARKERS AS SHOWN ON THE PLANS. MARKERS WILL BE REMOVED PRIOR TO RETURNING THE RUNWAY TO SERVICE. A DAY WILL BE MEASURED BY EACH 24 HOUR PERIOD THE MARKER IS IN USE FOR A CLOSURE.
6. LOCATE TEMPORARY ELECTRICAL JUMPERS ADJACENT TO LOW PROFILE BARRICADES WHERE POSSIBLE.

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
PHASE IIA (160 DAYS)		ANYTIME
PHASE IIB (2 DAYS)		OVERNIGHT ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS
BRANDON C. BEVILLE
121604
LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
1	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING - PHASE II

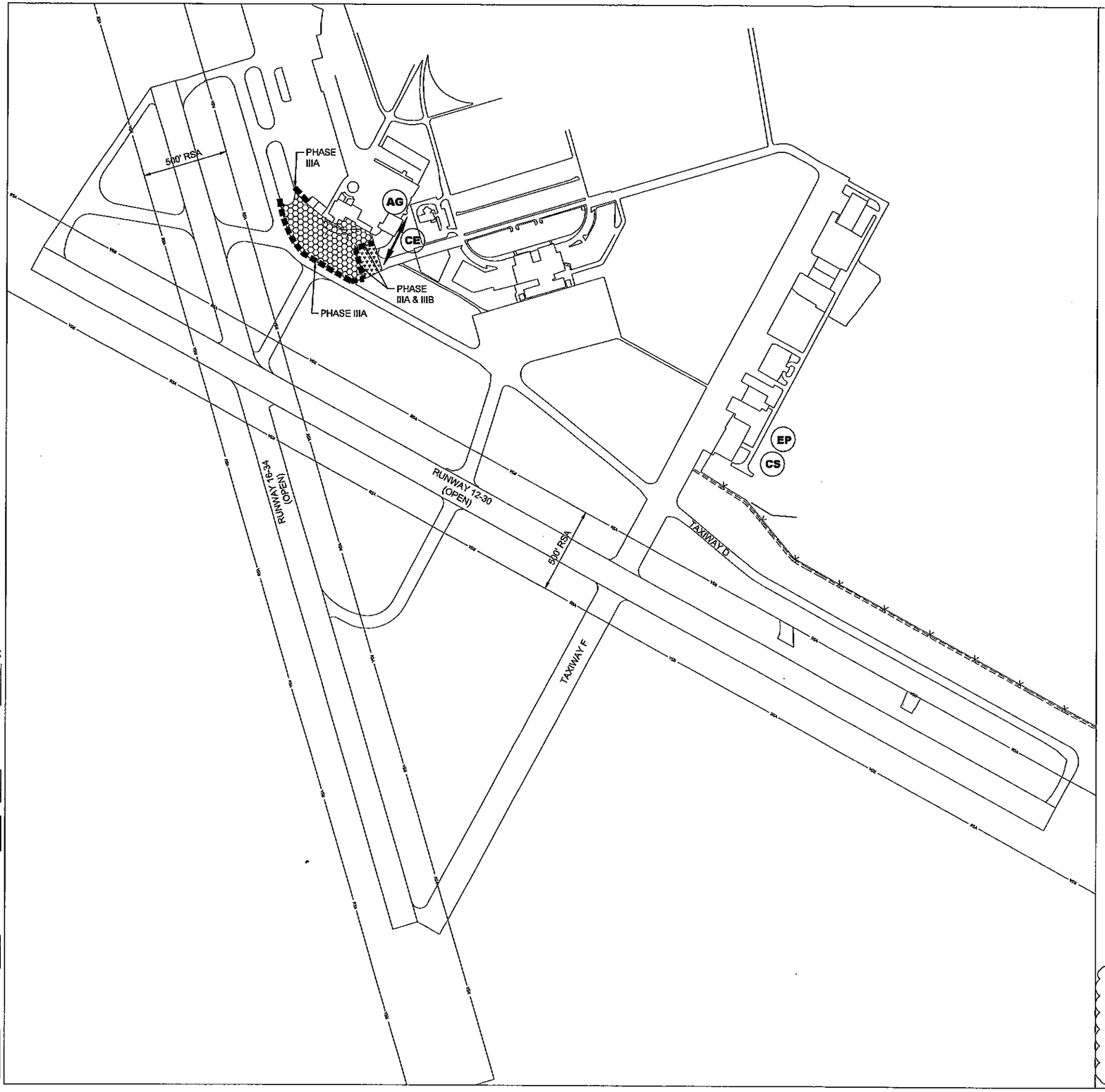
JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

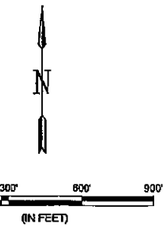
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DRAWING NUMBER
G-304

SHEET NUMBER 8

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Last plotted By: Rutabana, Ken K. Plot Style: Garver Standard Half.ctb Plot Scale: 1:2 Plot Date: 8/4/2017 10:08 AM Plotter used: \\phyvs02\Canon IR C4080 PS





PHASE III NOTES

1. PLACE LOW PROFILE AIRCRAFT BARRICADES AS INDICATED (SEE DETAIL ON SHEET G-302).
2. REHABILITATE WARE RAMP WITHIN PHASE III WORK LIMITS
3. REMARK WARE RAMP PAVEMENT WITHIN PHASE III WORK LIMITS.
4. REMOVE LOW PROFILE AIRCRAFT BARRICADES WHEN PHASE III IS COMPLETED.

LEGEND

- PHASE IIIA CONSTRUCTION AREA
- PHASE IIIB CONSTRUCTION AREA
- CONTRACTORS ACCESS/HAUL ROUTE
- FENCE
- PERIMETER ROAD
- LOW PROFILE AIRCRAFT BARRICADES (SEE SHEET G-302 FOR DETAILS)
- EXISTING DITCH
- (AG) ACCESS GATE
- (CS) CONTRACTOR'S STAGING
- (EP) CONTRACTOR'S EMPLOYEE PARKING
- (CE) CONTRACTOR'S ENTRANCE

GENERAL NOTES:

1. ALL EQUIPMENT AND PERSONNEL MUST REMAIN OUT OF THE RUNWAY SAFETY AREA WHILE THE RUNWAY IS ACTIVE.
2. SEE SHEET G-302 FOR SAFETY AND PHASING DETAILS.
3. CONTRACTOR'S ACCESS ROUTE PASSES THROUGH AN ACTIVE AIRCRAFT MOVEMENT AREA. CONTRACTOR TO PROVIDE FLAGMEN AND GUIDE VEHICLE FOR CONSTRUCTION TRAFFIC CROSSING THE ACTIVE AIRCRAFT MOVEMENT AREA. THE ACCESS ROUTE FROM THE CONTRACTOR'S STAGING AND STORAGE AREA TO THE WORK SITE WILL BE CONTINUOUSLY MONITORED FOR DEBRIS AND CLEANED IMMEDIATELY.

CONTRACT TIME

PHASE	CALENDAR DAYS	WORK AVAILABILITY
PHASE IIIA (5 DAYS)		OVERNIGHT ONLY
PHASE IIIB (5 DAYS)		WEEKEND ONLY

0 60 120 180 240 300 360

GARVER

REGISTRATION NO. F-5713

STATE OF TEXAS
BRANDON C. BEVILLE
121604
LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 08/04/2017

REV.	DATE	DESCRIPTION	BY
3	08/04/17	ADDENDUM NO. 3	CMB

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

SAFETY AND PHASING - PHASE III

JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: TDD
DRAWN BY: JS

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DRAWING NUMBER **G-305**

SHEET NUMBER **9**

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SECTION M
WAGE RATES

Article 5159a of the Revised Civil Statutes of Texas, passed by the 43rd Legislature Acts of 1933, Page 91, Chapter 45, provides that any government subdivision shall ascertain the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft or type of workman or mechanic and shall specify in the call for bids and in the Contract the prevailing rate of per diem wages which shall be paid for each craft type of workman. This Article further provides that the CONTRACTOR shall forfeit, as a penalty, to the City, County, or State, or other political subdivision, Ten Dollars ($10.00) per day for each laborer, or workman, or mechanic who is not paid the stipulated wage for the type of work performed by him as set up on the wage scale. The OWNER is authorized to withhold from the CONTRACTOR, after full investigation by the awarding body, the amount of this penalty in any payment that might be claimed by the CONTRACTOR or Subcontractor. The Act makes the CONTRACTOR responsible for the acts of the Subcontractor in this respect.

The Article likewise requires that the CONTRACTOR and Subcontractor keep an accurate record of the names and occupations of all persons employed by him and show the actual per diem wages paid to each worker, and these records are open to the inspection of the OWNER.

The Davis Bacon minimum wage rates for this project are as follows:

LABOR CLASSIFICATION AND MINIMUM WAGE SCALE

General Decision Number: TX170056 01/06/2017 TX56

Superseded General Decision Number: TX20160056

State: Texas

Construction Type: Highway

Counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, San Jacinto and Waller Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction;bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

* SUTX2011-013 08/10/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures)	$ 12.98	
ELECTRICIAN	$ 27.11	
FORM BUILDER/ FORM SETTER		
Paving & Curb	$ 12.34	
Structures	$ 12.23	
LABORER		
Asphalt Raker	$ 12.36	
Flagger	$ 10.33	
Laborer, Common	$ 11.02	
Laborer, Utility	$ 11.73	
Pipelayer	$ 12.12	
Work Zone Barricade Servicer	$ 11.67	
PAINTER (Structures)	$ 18.62	
POWER EQUIPMENT OPERATOR		
Asphalt Distributor	$ 14.06	
Asphalt Paving Machine	$ 14.32	
Broom or Sweeper	$ 12.68	
Concrete Pavement Finishing Machine	$ 13.07	
Concrete Paving, Curing, Float, Texturing Machine	$ 11.71	
Concrete Saw	$ 13.99	
Crane, Hydraulic 80 Tons or less	$ 13.86	
Crane, Lattice boom 80 tons or less	$ 14.97	
Crane, Lattice boom over 80 Tons	$ 15.80	
Crawler Tractor	$ 13.68	
Excavator, 50,000 pounds or less	$ 12.71	
Excavator, Over 50,000 pounds	$ 14.53	
Foundation Drill, Crawler Mounted	$ 17.43	
Foundation Drill, Truck Mounted	$ 15.89	
Front End Loader 3 CY or Less	$ 13.32	
Front End Loader, Over 3 CY	$ 13.17	
Loader/Backhoe	$ 14.29	
Mechanic	$ 16.96	
Milling Machine	$ 13.53	
Motor Grader, Fine Grade	$ 15.69	
Motor Grader, Rough	$ 14.23	
Off Road Hauler	$ 14.60	
Pavement Marking Machine	$ 11.18	
Piledriver	$ 14.95	
Roller, Asphalt	$ 11.95	
Roller, Other	$ 11.57	
Scraper	$ 13.47	
Spreader Box	$ 13.58	
Servicer.	$ 13.97	
Steel Worker		
Reinforcing Steel	$ 15.15	
Structural Steel Welder	$ 12.85	
Structural Steel	$ 14.39	
TRUCK DRIVER		
Low Boy Float	$ 16.03	
Single Axle	$ 11.46	
Single or Tandem Axle Dump	$ 11.48	
Tandem Axle Tractor w/Semi Trailer	$ 12.27	
WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.		

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union

average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- an existing published wage determination
- a survey underlying a wage determination
- a Wage and Hour Division letter setting forth a position on a wage determination matter
- a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

For current Wage Determination Decisions, see the Department of Labor website (http://www.wdol.gov/dba.aspx#0).

SECTION N
CHANGE ORDER FORM

Change Order

No. _____

Date of Issuance: Effective Date:
Project: Owner: Owner's Contract No.:
Contract: Date of Contract:
Contractor: Engineer's Project No.:

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments: (List documents supporting change):

CHANGE IN CONTRACT PRICE:
Original Contract Price:

CHANGE IN CONTRACT TIMES:
Original Contract Times:
☐ Working days ☐ Calendar days

Substantial completion (days or date):
$ Ready for final payment (days or date):
[Increase] [Decrease] from previously approved Change

Orders No._____ to No._____:

[Increase] [Decrease] from previously approved Change Orders
No._____ to No._____:

Substantial completion (days):

$ Ready for final payment (days):
Contract Price prior to this Change Order: Contract Times prior to this Change Order:

Substantial completion (days or date):

$ Ready for final payment (days or date):
[Increase] [Decrease] of this Change Order: [Increase] [Decrease] of this Change Order:
Substantial completion (days or date):

$ Ready for final payment (days or date):
Contract Price incorporating this Change Order: Contract Times with all approved Change Orders:

Substantial completion (days or date):
$ Ready for final payment (days or date):

RECOMMENDED:	ACCEPTED:	ACCEPTED:
_____	_____	_____
By:	By:	By:
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized signature)
_____	_____	_____
Date:	Date:	Date:

_____ _____
Approved by Funding Agency (if applicable): Date:

SECTION O
TECHNICAL SPECIFICATIONS

ITEM SS-100 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP)

DESCRIPTION

100-1.1 This item includes notes in reference to construction safety and phasing for the project. This item shall be used in conjunction with all Construction Safety Drawings and Construction Safety and Phasing Notes in the plans.

CONSTRUCTION SAFETY AND PHASING NOTES

100-2.1 COORDINATION.

a. Contractor Progress Meetings - The Owner, Engineer, and Contractor will hold progress meetings on a coordinated schedule during construction. Operational safety will be a standing agenda item in such meetings.

b. Scope or Schedule Changes - The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this contract and/or scope or schedule changes. The Contractor shall attend all such conferences.

c. –NOT REQUIRED-

100-2.2 PHASING. During performance of this project, the airport's runways, taxiways, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible. The project is phased to reduce operational impacts at the airport.

a. Phase Elements – If necessary for each phase, the construction safety drawings detail the areas closed to aircraft operations, estimated duration of closures, taxi routes, ARFF access routes, construction staging areas, construction access and haul routes, NAVAID impacts, lighting and marking changes, available runway length, declared distances, hazard marking and lighting, and required lead time for NOTAMS.

b. Construction Safety Drawings – See sheets G-301 through G-305 of the construction plans for construction safety drawings.

100-2.3 AREAS OF OPERATIONS AFFECTED BY CONSTRUCTION ACTIVITY.

a. Identification of Affected Areas – See the table below and the construction safety drawings for areas affected by construction for each phase.

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12-30 ARC	C-III	Same	Same	Same
Runway 12 Approach Minimums	½ Mile	Same	Same	Same
Runway 30 Approach Minimums	¾ Mile	Same	Same	Same
Runway 12 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12 Declared Distances	ASDA: 6,675	Same	Same	Same
	LDA: 6,675	Same	Same	Same
Runway 30 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same
	ASDA: 6,750	Same	Same	Same
	LDA: 6,750	Same	Same	Same
Runway 12 Approach Procedures	ILS/RNAV/VOR	Same	Same	Same
Runway 30 Approach Procedures	RNAV/LPV	Same	Same	Same
Runway 12 NAVAIDS	MALSR, DME	Same	Same	Same
Runway 30 NAVAIDS	PAPI	Same	Same	Same
Taxiway D ARC	ADG-III / TDG-V	ADG-III / TDG-III	ADG-III / TDG-III	ADG-III / TDG-III

b. Mitigation Efforts - See the table above and the construction safety drawings for mitigation efforts of operations affected by construction.

100-2.4 PROTECTION OF NAVIGATION AIDS (NAVAIDS). The Contractor must not conduct any construction activity within navigational aid restricted areas without prior approval from the local FAA Airway Facilities Sector representative. Navigational aids include instrument landing system components and very high-frequency omni-directional range airport surveillance radar. Such restricted areas are depicted on the construction safety drawings.

100-2.5 CONTRACTOR ACCESS.

a. Location of Stockpiled Materials - The Contractor may install a temporary fence around his construction staging area to separate his material stockpile, equipment storage, and parking areas from the public. No personal vehicles of contractor's employees will be allowed inside the secured area of the airport. All material deliveries shall be received in the staging area reserved by the contractor. No delivery trucks will be allowed access to a secured area of the airport beyond this staging area. Stockpiled materials and equipment are not permitted within the active runway safety area and obstacle free zone. The contractor shall receive approval from the Engineer and FAA air spacing office prior to locating stockpiles or equipment within the object free area, safety area, or obstacle free zone. No stockpile shall be greater than 15-ft in height.

b. Vehicle and Pedestrian Operations - See the construction safety drawings for construction site parking, equipment storage areas, and access and haul routes. Vehicular traffic shall always yield to aircraft traffic.

When any vehicle, other than one that has prior approval from the airport operator, must travel over any portion of an aircraft movement area, it will be escorted and properly identified. To operate in those areas during daylight hours, the vehicle must have a flag or beacon attached to it. Any vehicle operating on the

movement areas during hours of darkness or reduced visibility must be equipped with a flashing dome-type light, the color of which is in accordance with local or state codes.
All construction vehicles shall be clearly identified for control purposes by prominently displaying the company name on each side of the vehicle. The identification symbols should be a minimum 8-inch block-type characters of a contrasting color and easy to read. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable.

At 14 CFR Part 139 certified and towered airports, all vehicle operators having access to the active parts of the airfield must be familiar with airport procedures for the operation of ground vehicles and the consequences of noncompliance or be escorted by someone who is. Those trained must provide a certificate of training to the airport prior to accessing the airfield. Only those trained and providing a certificate as such will have escorting privileges.

Personnel entering the active parts of the airport must be in possession of and display a valid airport identification badge at all times or must be escorted by a person with the above-noted escorting privileges. Any person who is escorting individuals must be in direct control of the escorted individuals at all times. Any fine, including any and all associated costs, assessed the airport for failure to maintain security of the airport which are a result of the negligence of the prime contractor, any of his subcontractors, or any supply/delivery personnel, will be assessed to the prime contractor and shall be deducted from any monies due him.

Vehicular traffic located in or crossing an active movement area must have a working two-way radio in contact with the control tower or be escorted by a person in radio contact with the tower. The driver, through personal observation, should confirm that no aircraft is approaching the vehicle position. Construction personnel may operate on the airfield without two-way radio communication provided a NOTAM is issued closing the area and the area is properly marked to prevent incursions. Two-way radio communications are required between Contractor personnel and the Airport Traffic Control Tower/Airport Aeronautical Advisory Stations "Beaumont Ground" (119.50MHz) between the hours of 06:00 and 22:00; and UNICOM (122.95MHz) between the hours of 22:00 and 06:00 daily. Continuous monitoring is required only when equipment movement is necessary in certain areas.

c. Control of Gates - The Contractor shall be responsible for maintaining the security of the access gates by keeping the access gate locked or guarded at all times. Should the Contractor fail, at any time, to keep the access gate locked or guarded, there shall be a fine of $200.00 assessed to the Contractor, for each occurrence that the Contractor fails to maintain the security of the access gate. All fines assessed to the Contractor shall be deducted from any monies due to him/her.

100-2.6 WILDLIFE MANAGEMENT. The Contractor shall review AC 150/5200-33, hazardous wildlife attractants on or near airports, and CertAlert 98-05, grasses attractive to hazardous wildlife (www.faa.gov). The Contractor shall carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports. The contractor shall mitigate the following items.

a. Trash - The Contractor shall perform trash clean-up on a daily basis.

b. Standing Water - The Contractor provide temporary drainage during construction to avoid standing water.

c. Tall Grass and Seeds - The Contractor shall adhere to the requirements of Section T-901, Seeding of the contract documents and specifications.

d. Poorly Maintained Fencing and Gates - The Contractor shall immediately report any damage to gates or fences. The Contractor will be responsible for repairs to any gates or fences caused by negligence by the Contractor.

e. Disruption of Existing Wildlife Habitat - The Contractor shall notify the airport immediately of any wildlife sightings.

100-2.7 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT.

The Contractor shall ensure that the pavement surfaces in the active movement area are kept clean from dirt, mud, and other debris from the Contractor's equipment. Frequent clean up in the vicinity of Contractor's work areas is required.

The Contractor shall require vehicle operators to check tires prior to traversing active airfield pavement. Any material tracked onto an active airfield pavement by construction equipment shall be immediately removed. See AC 150/1510-24, foreign object debris (FOD) management (www.faa.gov) for further instruction.

100-2.8 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT.

If any construction vehicle or equipment is operated within airport property, the Contractor must be adequately prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks. Special care must also be taken when handling or transporting hazardous materials on airport property. The contractor shall notify the Engineer immediately after any hazardous material spill. Management of hazardous wastes must strictly follow the most current stringent Federal, State and local regulations governing treatment, storage, and disposal. See AC 150/5320-15, management of airport industrial waste (www.faa.gov), for further instruction.

100-2.9 NOTIFICATION OF CONSTRUCTION ACTIVITIES.

a. List of Responsible Representatives - A point of contact list will be completed as part of ITEM SS-101 Safety Plan Compliance Document (SPCD) and will be delivered to all parties prior to construction.

b. Notices to Airmen (NOTAM) - Before beginning any construction activity, the Contractor must, through the airport operator, give notice using the NOTAM system of proposed location, time, and date of commencement of construction. Upon completion of work and return of all such areas to standard conditions, the Contractor must, through the airport operator, verify the cancellation of all notices issued via the NOTAM system giving a 72 hour (weekdays) advance notice.

c. Emergency Notification Procedures - In the event of an emergency, the Contractor shall call airport emergency response 719-4950; and 911. Contractor is to also immediately notify the Engineer.

d. Coordination with ARFF personnel - Any deactivation of water lines or hydrants, rerouting of access routes, or use of hazardous materials on the airfield shall be coordinated and approved by the airport's ARFF personnel prior to execution of such activities.

e. Notification to the FAA - The Contractor shall ensure, through the Engineer, that all construction equipment over 25-ft in height is air spaced through the appropriate FAA regional or district office prior to using such equipment on site.

Shutdown of any NAVAID (airport or FAA owned) shall be coordinated with the FAA ATO 45 days prior to the proposed shutdown. The Contractor shall provide an additional seven days advance notice to the airport to coordinate with the FAA ATO Tech Ops office responsible for the FAA facilities.

100-2.10 INSPECTION REQUIREMENTS.

a. Daily Inspections - The Contractor shall perform daily safety inspections to ensure all construction operations are in conformance with the CSPP.

b. Final Inspections - Prior to opening any portion of the airport to traffic, the Contractor, Engineer, and airport operator shall perform a safety inspection of the area to be opened to traffic to ensure conformance with the CSPP and FAA standards.

100-2.11 UNDERGROUND UTILITIES. Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown. Prior to beginning any type of excavation, the contractor shall contact the utilities involved and make arrangements for the location of the utilities on the ground. The contractor shall maintain the utility location markings until they are no longer necessary.

Texas state law, the underground facilities damage prevention act, requires ten working days advance notification through the one-call system center before excavating using mechanized equipment or explosives (except in the case of an emergency). The one-call system phone number is 1-800-245-4848, or 811. The contractor is advised that there is a severe penalty for not making this call. Not all utility companies are members of the one-call system; therefore, the contractor is advised to contact all non-member utilities as well as the one-call system.

Due to FAA underground cables being located in the areas depicted in the plans, the contractor shall use extreme caution when working in these areas. The Contractor shall notify FAA ATO Ops personnel a minimum of 10 days prior to construction in these areas to ensure no FAA utilities will be impacted. Any FAA equipment or utilities damaged during construction shall be replaced by the contractor at no expense to the owner or the FAA.

100-2.12 PENALTIES. Failure of the Contractor (including employees) or any of his subcontractors (including employees) to comply with ATCT instructions, the airport safety plan, or any of the other requirements of the airport while operating on airport property, shall be subject to the following:

a. First Offense - The Contractor shall receive a fine of $1,000.00, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fines or penalties imposed on the airport as a result of the incident will be assessed to the Contractor.

b. Second Offense - The Contractor shall receive a fine of $5,000.00 to be deducted from any monies due him, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fine or penalties imposed on the airport as a result of the incident will be assessed to the contractor.

c. Third Offense - Work will be suspended. The Contractor (including employees) and any of his subcontractors (including employees) who will operate ground vehicles on the airport shall successfully complete, for a second time, formalized airport safety training, to be conducted by airport staff. When the contractor's employees have completed airport safety training to the satisfaction of the owner, work may continue at the discretion of the Owner.

100-2.13 RUNWAY AND TAXIWAY VISUAL AIDS.

a. General - All airport markings, lighting, signs, and visual NAVAIDs that are in operation must be clear from all obstructions. All temporary markings, signs, lights, or other visual aids must be secured in place to prevent prop wash, jet blast, wing vortices, or other wind currents.

b. Markings - All temporary or permanent runway and taxiway visual aids shall conform to the requirements of the most recent edition of FAA AC 150/5340-1 (www.faa.gov). Markings for this project include the following:

i. Temporarily Closed Taxiways – The Contractor shall be responsible for furnishing, installing, and maintaining taxiway closure markers at the entrance to the closed taxiway from the adjacent runway. The taxiway closure markers shall be installed inside the runway safety area. The

contractor shall also furnish and install low profile barricades at the entrance to the closed taxiway from an adjacent taxiway. Barricades shall be installed outside all active taxiway safety areas. See details on construction safety drawings for closed taxiway marker and low-profile aircraft barricade details.

c. Lighting and Visual Aids – All temporary lighting for runway and taxiway systems shall conform to the requirements of the most recent edition of FAA AC 150/5340-30 and 150/5345-50 (www.faa.gov). The contractor shall be responsible for disconnecting isolation transformers associated with any runway or taxiway light fixtures that are being disconnected.

d. Signs - The Contractor shall install all signs in accordance with the most recent edition of FAA AC 150/5345-44 and 150/5340-18. Any sign that is not performing its normal function must be covered or removed to prevent misleading pilots.

100-2.14 MARKING AND SIGNS FOR ACCESS ROUTES. The contractor shall be responsible for supplying and installing all necessary markings and signage for all access routes to and from the site to be used by contractor personnel, subcontractor personnel, or delivery operations. All signage in the air operations area shall be frangible mounted.

100-2.15 HAZARD MARKING AND LIGHTING

a. Purpose - Hazard marking and lighting prevents pilots from entering areas closed to aircraft and prevents contractor personnel from entering areas open to aircraft.

b. Equipment - The contractor shall furnish, install, and maintain low-profile barricades in hazardous areas inside movement areas. Barricades shall restrict access and make hazards obvious to aircraft, personnel, and vehicles. During periods of low visibility and at night, barricades shall be equipped with red flashing or steady burning lights. The spacing of barricades shall be such that a breach is physically prevented barring a deliberate act. If barricades are intended to prevent pedestrians, then they shall be linked. See details on construction safety drawings for low-profile aircraft barricade detail.

100-2.16 PROTECTION OF SAFETY AREAS, OBJECT FREE AREAS, OBJECT FREE ZONES, AND APPROACH/DEPARTURE SURFACES:

a. Runway Safety Areas (RSA) - No work shall be permitted within an active RSA. If required, adjustments to the RSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. The Contractor shall insure adequate distance protection for blast projection, as needed. All open trenches or excavations within the limits of the RSA shall be back filled or covered prior to opening the runway to operations. In addition, erosion control measures shall be provided in the RSA to prevent ruts, humps, or depressions inside the limits of the RSA.

b. Runway object free areas (ROFA) - No material shall be stockpiled inside the limits of the active ROFA unless approved by air spacing through the appropriate FAA airports regional or district office.

c. Taxiway safety areas (TSA) - No work shall be permitted within an active TSA. If required, adjustments to the taxiway TSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. All open trenches or excavations within the limits of the TSA shall be back filled or covered prior to opening the taxiway to operations. In addition, erosion control measures shall be provided in the TSA to prevent ruts, humps, or depressions inside the limits of the TSA.

d. Taxiway Object Free Areas (TOFA) - No construction shall be permitted inside an active TOFA unless the taxiway has been restricted to operations requiring a TOFA equal to that of the TOFA available. If required, construction may be permitted inside the TOFA if the taxiway centerline markings are offset with centerline reflectors or lighting, or appropriate NOTAMs are issued. Construction may also be permitted inside the TOFA if a five foot wing tip clearance is maintained for all construction equipment

and vehicles. In this scenario, flaggers and wing walkers must be used to direct traffic through the construction site.

e. Obstacle Free Zone (OFZ) - No personnel, material, or equipment shall penetrate the OFZ while the runway is open to operations. The dimensions of the OFZ are as defined in FAA AC 150/5300-13 (www.faa.gov).

f. Approach/Departure Surfaces - All contractor personnel, materials, and equipment shall remain clear of the applicable threshold siting surfaces as defined in Chapter 3 of FAA AC 150/5300-13 (www.faa.gov). Construction activities that require penetration into the threshold siting surface shall be accomplish through displacing or partially closing the runway. Such construction activities shall require coordination with the FAA airports regional or district office.

100-2.17 OTHER LIMITATIONS ON CONSTRUCTION

a. Prohibitions - The use of equipment (i.e. cranes, concrete pumps) over 35 feet in height shall not be used unless approved by the engineer and proper coordination for FAA aeronautical study is completed. The submittal for this coordination shall take place at least 45 days prior to anticipated use.

Open flame welding and torch cutting operations are not permitted unless adequate fire safety precautions are provided and these operations are authorized by the airport operator and the engineer.

Electrical blasting caps shall not be permitted within 1,000-ft of the airport property. Flare pots are not permitted within the air operations area.

MEASUREMENT AND PAYMENT

100-3.1 Adherence to the requirements of the CSPP will not be measured for separate payment.

END OF ITEM SS-100

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ITEM SS-101 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

DESCRIPTION

101-1.1 The contractor shall thoroughly review the approved Construction Safety and Phasing Plan (CSPP) and shall comply with approved CSPP. The contractor shall certify such compliance by completing the attached SPCD and submitting to the Engineer for approval.

Contractor Safety Plan Compliance Documents

Owner Name: Jefferson County

Airport: Jack Brooks Regional Airport

Project Description: Taxiway 'D' Reconstruction (2017)

Contractor: _____

Each item listed below corresponds to a specific section of the approved CSPP. The contractor shall certify that he/she will comply with each section of the approved CSPP. Each certified section with a "no" response must be fully explained in an attachment to the SPCD. The document shall be signed and dated by a principle or owner in the Contractor's company. All other requested information shall be completed by the Contractor and submitted to the Engineer for approval as part of the SPCD.

1. **Section 1 - Correspondence:** This project shall be completed in accordance with Section 1 "Coordination" of the approved Construction Safety Plan Compliance Document.

Owner:	
Contact: Alex Rupp, Airport Manager	**Phone:** 409-719-4900
Engineer:	
Project Manager: Tom Dodson	**Phone:** 713-491-8333
Project Engineer: Javier Suarez	**Phone:** 713-491-8333
Construction Observer: Steve Escagne	**Phone:** 972-951-8234
Materials Testing: Liana Collier	**Phone:** 409-377-4991
Contractor:	
Project Manager:	**Phone:**
Superintendent:	**Phone:**
Subcontractors:	
LIST ALL SUBS	

Yes_____No_*

2. **Section 2 - Phasing:** This project shall be completed in accordance with Section 2 "Phasing" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

3. **Section 3 – Areas of Operations Affected by Construction Activity:** This project shall be completed in accordance with Section 3 "Areas of Operations Affected by Construction Activity" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

4. **Section 4 – Protection of Navigational Aids (NAVAIDS):** This project shall be completed in accordance with Section 4 "Protection of Navigational Aids (NAVAIDS)" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

5. **Section 5 – Contractor Access:** This project shall be completed in accordance with Section 5 "Contractor Access" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

6. **Section 6 – Wildlife Management:** This project shall be completed in accordance with Section 6 "Wildlife Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

7. **Section 7 – Foreign Object Debris (FOD) Management:** This project shall be completed in accordance with Section 7 "Foreign Object Debris (FOD) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

8. **Section 8 – Hazardous Materials (HAZMAT) Management:** This project shall be completed in accordance with Section 8 "Hazardous Materials (HAZMAT) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

9. **Section 9 – Notification of Construction Activities:** This project shall be completed in accordance with Section 9 "Notification of Construction Activities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

10. **Section 10 – Inspection Requirements:** This project shall be completed in accordance with Section 10 "Inspection Requirements" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

11. **Section 11 – Underground Utilities:** This project shall be completed in accordance with Section 11 "Underground Utilities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

12. **Section 12 – Penalties:** This project shall be completed in accordance with Section 12 "Penalties" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

13. **Section 13 – Special Conditions:** This project shall be completed in accordance with Section 13 "Special Conditions" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

14. **Section 14 – Runway and Taxiway Visual Aids:** This project shall be completed in accordance with 14 "Runway and Taxiway Visual Aids" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

15. **Section 15 – Marking and Signs for Access Routes:** This project shall be completed in accordance with Section 15 "Marking and Signs for Access Routes" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

16. **Section 16 – Hazard Marking and Lighting:** This project shall be completed in accordance with Section 16 "Hazard Marking and Lighting" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

17. **Section 17 – Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces:** This project shall be completed in accordance with Section 17 "Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

18. **Section 18 – Other Limitations on Construction:** This project shall be completed in accordance with Section 18 "Other Limitations on Construction" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

I certify that, for the project identified herein, the responses to the foregoing items are correct as marked, and that I shall comply with the approved Construction Safety and Plan.

Signed: _____
Contractor's Authorized Representative

Date: _____

_____
Print Name and Title of Contractor's Representative

END OF ITEM SS-101

ITEM SS-110 STANDARD SPECIFICATIONS

GENERAL

110-1.1 The standard specifications adopted by the Texas Department of Transportation (November 1, 2014) are bound in a book titled "Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges". These specifications are referred to herein as "Standard Specifications." The latest edition shall apply. A copy of these "Standard Specifications" may be purchased or downloaded by going to the Texas Department of Transportation's web page, http://www.txdot.gov, contacting Support Services Division, or calling the Texas Department of Transportation's Support Services Division. For additional information on specifications or information on Departmental Materials Specifications (DMS), Material Producer Lists (MPL), Test Procedures, Material Inspection Guide, and other materials information, go to http://www.txdot.gov.

INCORPORATION AND MODIFICATION

110-2.1 Certain parts of the Standard Specifications are appropriate for inclusion in these Technical Specifications. Such parts are incorporated herein by reference to the proper section or paragraph number. The individual specification numbers noted herein may be different from those in the latest edition of the "Standard Specifications." The most current specification number shall apply. Each such referenced part shall be considered to be a part of these Contract Documents as though copied herein in full.

110-2.2 Certain referenced parts of the Standard Specifications are modified in the Specifications that follow. In case of conflict between the Standard Specifications and the Specifications that follow, the Specifications that follow shall govern.

110-2.3 Individual material test numbers change from time to time. Use the latest applicable test.

110-2.4 Reference in the Standard Specifications to the "Department" is herein changed to the "Owner".

END OF ITEM SS-110

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ITEM SS-120 SITE PREPARATION

DESCRIPTION

120-1.1 This item covers the preparation of the site for construction of the proposed improvements. The attention of the bidder is directed to the necessity for careful examination of the entire project site to determine, at the time of bid preparation, the full extent of work to be done under the item "Site Preparation." The entire job site shall be cleared of all man-made obstructions and debris, of whatever nature, and made ready in all respects for the construction of the proposed improvements.

The item "Site Preparation" shall include:

1. Mobilization
2. Furnishing Temporary Field Office
3. Lighted Barricades and Closed Taxiway and Runway Markings
4. Contractor's Access/Haul Road
5. Contractor's Staging Areas
6. Lockout/Tagout Program
7. Airport Security Requirements
8. Airport Safety Requirements
9. Instrument Control
10. Clean Up

CONSTRUCTION METHODS

120-2.1 MOBILIZATION. The Contractor shall consider and include his cost for providing personnel, equipment, materials, bonds, etc. required for the prosecution of the work under this item. This is in unison with Mobilization as described in the General Conditions Section 105.

120-2.2 FURNISHING TEMPORARY FIELD OFFICE. The building for the temporary field office shall be for the exclusive use by the Engineer as a field office and shall conform to the requirements listed below. The dimensions and other requirements specified herein are minimums and the building may be built by the Contractor for the specific purposes noted herein. It is not intended, however, to prohibit the use of commercially built trailers or prefabricated buildings which may deviate in minor dimension or detail from the requirements listed herein but may in some features exceed the listed requirements and in all major respects be entirely suitable for the purpose intended. The Engineer will determine the suitability of any building furnished. It shall be the responsibility of the Contractor to coordinate and obtain also necessary permits and install all required temporary facilities to provide a complete and usable temporary field office.

Minimum requirements for offices:

a. The building may be portable or other suitable type with 7-ft minimum ceiling height; must be floored, weatherproof and reasonably dustproof; must have at least two glazed sliding windows provided with window latches; must have at least one door provided with a substantial lock and all keys placed in the possession of the Engineer. Doors and windows shall be screened. The building need not be new but the facility furnished under this item shall be neat, clean, sound and usable for the purpose intended.

b. The building shall be provided with electric lights and power outlets arranged as directed by the Engineer. The building shall be provided with equipment in good working order. In cold weather

the building shall be provided with adequate vented space heating facilities and fuel for heating. In hot weather the building shall be equipped with adequate air conditioning units. Heating and cooling and telephone utility service will be furnished at no cost to the Owner or Engineer.

c. The building for the field office shall provide not less than 240 sq. ft. of floor space. At least two tables each suitable for desk and drafting table work shall be provided with approximate dimensions of 30" x 48". These tables may be movable, attached to a wall, or built-in. Each table will be provided with at least two drawers (minimum dimensions: 8" deep x 12" wide by 24" long) or equivalent cabinet or shelf space for storing field books and records.

d. The building shall be provided with internet access with a minimum download speed of 24 megabytes per second. This service shall be provided for the length of the contract or construction project, whichever is greater.

Furnishing the field office will not be measured for separate payment, but will be considered subsidiary to "Site Preparation." The building shall remain the property of the Contractor and be returned to him at the close of the construction period.

120-2.3 LIGHTED BARRICADES AND CLOSED TAXIWAY AND RUNWAY MARKINGS. The Contractor shall furnish, install, maintain, and remove closed taxiway and runway markings and lighted barricades in accordance with details on the plans and as directed by the Engineer. The closed runway markers shall be aviation yellow, nylon-reinforced vinyl. The markers shall be secured to the pavement/ground as shown on the plans and as directed by the Engineer. The lighted barricades shall be constructed and installed as shown on the plans. All lighted barricades and closed taxiway and runway markings shall be constructed in accordance with AC 150/5370-2F Operational Safety on Airports During Construction.

All work involved in the furnishing, installation, maintenance, and removal of lighted barricades, barrels and closed runway markings will not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation."

120-2.4 CONTRACTOR'S ACCESS/HAUL ROAD. The Contractor shall layout, construct, maintain, and repair all access/haul roads needed to construct the work. The contractor shall video the any intended haul routes from the edge of airport property to the construction work areas. The existing access roads shown on the plans shall be repaired, as determined necessary by the Engineer, at the close of the project. All such work, including all materials and labor, involved in the layout, construction, maintenance, and repair of the Contractor's access/haul roads will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation." Temporary pipe culverts shall be installed and maintained as required and shall be of the size as directed by the Engineer. The type of pipe used for temporary pipe shall be at the option of the Contractor. Temporary pipe culverts will not be measured for separate payment, but will be considered subsidiary to the access/haul road. All temporary pipe culverts shall be removed by the Contractor and shall remain his property at the close of the project.

120-2.5 CONTRACTOR'S STAGING AREAS. The areas designated in the plans or by the Engineer as the Contractor's staging area shall be cleared and graded by the Contractor as needed for use by the Contractor in constructing the work on this project. All areas used or otherwise occupied by the Contractor for his operations shall be cleaned, regraded, and seeded, as directed by the Engineer, prior to the final acceptance of the project by the Airport. All work involved in the preparation and restoration of areas used or occupied by the Contractor, including clearing, grubbing, regrading, seeding, and installing and removing fence, will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.6 LOCKOUT / TAGOUT PROGRAM. The Contractor shall submit a complete copy of an electrical energy source Lockout/Tagout Program in accordance with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, that meets the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and the related safety requirements are the sole responsibility of the Contractor.

120-2.7 AIRPORT SECURITY REQUIREMENTS. The Contractor shall abide by the Airport Security requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. Any costs associated with the Airport Security requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.8 AIRPORT SAFETY REQUIREMENTS. The Contractor shall abide by the Airport Safety requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. All costs associated with the Airport Safety requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.9 INSTRUMENT CONTROL. The Contractor will be furnished survey baselines and benchmarks to control the work as shown on the Plans. The Contractor shall be responsible for the additional instrument control necessary to layout and construct the work. The Contractor shall provide the instrument control as provided for in Section 50 of the General Provisions. The Contractor's instrument control of the work shall not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation".

120-2.10CLEAN UP. From time to time, the Contractor shall clean up the site in order that the site presents a neat appearance and that the progress of work will not be impeded. One such clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

MEASUREMENT AND PAYMENT

120-3.1 Site preparation will be measured as a lump sum complete item. Work completed and accepted under this item will be paid for at the contract lump sum price bid for "Site Preparation," which price shall be full compensation for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Item SS-120-1 Site Preparation - per Lump Sum

A minimum of two (2) partial payments will be made for Site Preparation up to a limit based on a percentage of the Total Contract Value and not the amount bid. Periodic payments will be made in proportion to the amount of work accepted for payment in monthly pay applications, as outlined in the table below.

Monthly Pay Application Total exceeds	Partial Payment of Site Preparation
1% of total Contract value	50% of Site Preparation, up to 2.5% of total Contract value, less retainage
5% of total Contract value	100% of Site Preparation, up to 5% of total Contract value, less retainage

Any remaining partial payments for "Site Preparation" will be when the work is completed to 95% of the Contract total value.

END OF ITEM SS-120

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ITEM SS-300 BASIC ELECTRICAL REQUIREMENTS

DESCRIPTION

300-1.1 This item shall consist of furnishing and installing complete electrical systems as defined in the plans and in these specifications. The work includes the installation, connection and testing of new electrical systems, equipment and all required appurtenances to construct and demonstrate proper operation of the completed electrical systems.

300-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars and standards on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

300-1.3 This work shall consist of lockout/tagout and constant current regulator calibration procedures at the airport electrical vault in accordance with the design and details shown in the plans and in compliance with these specification documents.

EQUIPMENT AND MATERIALS

300-2.1 STANDARDS.

a. Applicable National Fire Protection Association (NFPA) codes, including but not limited to:
   (1) NFPA 70 - National Electrical Code.
   (2) NFPA 70E - Standard for Electrical Safety in the Workplace.
   (3) NFPA 72 - National Fire Alarm Code.
   (4) NFPA 101 - Life Safety Code.
   (5) Internet Website: http://www.nfpa.org

b. Applicable Code of Federal Regulations (CFR) codes, including but not limited to:
   (1) 29 CFR 1910 - Occupational Safety and Health Standards (OSHA)
   (2) 29 CFR 1926 - Safety and Health Regulations for Construction.
   (3) Internet Website: http://www.gpoaccess.gov/cfr/index.html

c. ANSI/IEEE C2 - National Electrical Safety Code.

d. NECA 1 – Standard for Good Workmanship in Electrical Construction.

e. Applicable Federal, State and Local Electrical Codes.

f. Applicable Federal, State and Local Energy Codes.

g. Applicable Federal, State and Local Building Codes.

h. Applicable Federal, State and Local Fire Codes.

i. Applicable City Electrical Code.

j. Applicable City Ordinances pertaining to electrical work.

k. Applicable Federal, State and Local - Environmental, Health and Safety Laws and Regulations.

Contractor shall utilize the most current editions of standards, which are current at time of bid and as recognized by the Authority Having Jurisdiction for the respective standard.

300-2.2 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, current version on the date that the submittals are received by the Engineer.

b. Airport lighting equipment and materials shall also meet the Buy American Preference requirements in 49 USC 50101 and the Aviation Safety and Capacity Expansion Act. The equipment

shall be approved and listed on the FAA "Equipment Meeting Buy American Requirements" list located at *www.faa.gov/airports/aip/procurement/federal_contract_provisions/*, current version on the date that the submittals are received by the Engineer, or the Contractor may submit a signed formal letter from the manufacturer that clearly lists the specific equipment, model number, location where it is manufactured, and statement certifying that the equipment and/or materials meet the Buy American Preference requirements.

c. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer. All equipment and materials shall be new and meet applicable manufacturer's standards. All other electrical components and products, not covered under the FAA equipment certification program, shall be tested and listed by an OSHA accepted, nationally recognized testing laboratory (NRTL) to conform to the standards indicated in these contract documents and to the industry standards required in the NEC, NEMA, IEEE, UL, and applicable FAA advisory circulars.

d. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

e. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components or electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

f. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

g. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

(1) All LED light fixtures, with the exception of obstruction lighting, shall be warranted by the manufacturer for a minimum of 4 years after date of installation, final acceptance testing by the Engineer, and Owner's beneficial use of the equipment, inclusive of all electronics. Refer to FAA Engineering Brief No. 67D for additional requirements.

h. Refer to Special Provisions item C-12 Submittals for electronic or paper submittal requirements for Engineer's review.

i. After approval of submitted equipment, the Contractor shall supply the following Operation and Maintenance Manual documentation to the Owner. Two (2) complete sets of documentation shall be supplied for each model of equipment. The documentation shall be securely bound in heavy-duty 3-ring binders. The information for each piece of equipment shall be indexed using typewritten label tabs. The

spine of each binder shall have a typewritten label, which indicates the included equipment types. The documentation shall include:

(1) Approved Submittals and Shop Drawings
(2) Cable Splicer Qualifications, Type and Voltage
(3) State Contractors License with Electrical Classification
(4) Master, Journeyman and Apprentice Electrician Licenses and Certifications
(5) Lockout/Tagout Program
(6) Regulator Load and Calibration Reports for testing, checking and adjusting all regulators in the electrical vault
(7) Megger Test Reports
(8) Ground Rod Test Reports
(9) Installation Manuals
(10) Operation Manuals
(11) Maintenance Manuals
(12) Parts Lists, including recommended spare parts. Recommended spare parts shall be furnished with the respective equipment.

j. After approval of the O&M Manuals, the Contractor shall provide three (3) complete electronic copies of all documentation in Adobe PDF file format on CD-R (non-rewriteable) discs storage media. The electronic files shall contain searchable text and include a hyperlink index for ease in locating information with the PDF file.

k. All requirements herein Item SS-300 shall be applicable to all referenced sections in these contract documents and applicable to all sections which reference Item SS-300.

l. The Contractor is the single source of responsibility for the installation and integration of the airport's lighting, power, and control systems. New airport lighting equipment and materials shall be fully compatible with all other new and existing airport lighting equipment and systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-2.3 OPERATION AND MAINTENANCE DATA.

Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment. Provide bound hard copies and electronic copies as noted in section 300-2.2.

a. Certificate of Substantial Completion, Release and Contractor's Affidavit, executed copies.

b. Final approved equipment submittals, including product data sheets and shop drawings, clearly labeled.

c. Preventive maintenance programs for the visual aid facilities and equipment installed in this project, including the applicable equipment sections within Chapter 5 "Preventive Maintenance" from AC 150/5340-26 (latest edition) "Maintenance of Airport Visual Aid Facilities".

d. Installation manuals: Description of function, installation and calibration manuals, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

e. Operations manuals: Manufacturer's printed operating instructions and procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping,

shutdown, and emergency instructions; summer and winter operating instructions; and all programming and equipment settings.

f. Maintenance manuals: Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

g. Service manuals: Servicing instructions and lubrication charts and schedules, including the names and telephone numbers of personnel to contact for both routine periodic and warranty service for equipment and materials provided under this Specification.

h. Final test reports, clearly labeled, including but not limited to, insulation resistance test reports, ground rod impedance test reports, cable pulling tension values logs, and equipment certification tests.

i. Final certified calibration sheets for all equipment and instruments, including but not limited to, constant current regulator calibration reports.

300-2.4 WIRE. Unless otherwise indicated, conductors No. 10 AWG and smaller shall be solid, and conductors No. 8 AWG and larger shall be stranded.

For electrical work of 600 volts or less, all conductors, terminations, terminal blocks, lugs, connectors, devices and equipment shall be listed, marked, and rated 75 degrees C minimum unless otherwise noted.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway. Pull ropes and pull wires shall have sufficient tensile strength for the cable(s) to be pulled and installed. Damaged cable or raceway shall be replaced at no additional cost to the Owner.

Install pull wires in empty raceways. Use a polypropylene plastic line with not less than 200 pound tensile strength. Secure and leave at least 12 inches of slack at each end of pull wire to prevent it from slipping back into the conduit. Cap spare raceways with removable tapered plugs, designed for this purpose.

Colorable L-824 cable in solid non-fading colors shall not be used for permanent series circuit identification. The color coding shall be continuous throughout the facility and airfield for each series circuit and conductor so that the circuit and conductor are readily identifiable. Mixing of colors for a series circuit is unacceptable.

300-2.5 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, with a minimum 28-day compressive strength of 3500 PSI (unless otherwise noted) using 1-inch (25-mm) maximum size coarse aggregate, as determined by test cylinders made in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Flowable backfill material may only be used where specifically indicated in the Plan details.

300-2.6 SWITCHES. Main disconnect switches 600 volt or less shall be UL service entrance rated, industrial circuit breaker type, pad-lockable, heavy duty type with neutral and ground kits and poles and ratings as indicated on the drawings and suitable for the application indicated. Exterior switches shall be NEMA 3R rated.

300-2.7 WIND CONES AND SEGMENTED CIRCLES.

Provide the wind cone with an L-810 obstruction light, installed as indicated in the plans and in accordance with the manufacturer's recommendations.

The segmented circle airport marker system shall conform to the requirements of AC 150/5340-5, Segmented Circle Airport Marker System. Install the segmented circle. Submit shop drawings for review and approval by the Engineer prior to field construction work.

CONSTRUCTION METHODS

300-3.1 LOCKOUT/TAGOUT PROGRAM. The Contractor shall provide a complete copy of an electrical energy source Lockout/Tagout Program to the Owner, with copy to the Engineer. The document shall clearly identify the on-site master electricians and their contact information, including office and mobile telephone numbers.

The Lockout/Tagout Program shall comply with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, and meet the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and all other related safety requirements are the sole responsibility of the Contractor.

300-3.2 SAFETY PROGRAM. The Contractor shall implement an electrical safety program that complies with NFPA 70E and 29 CFR 1926.

Implementation of the Electrical Safety Program, determining and providing proper Personal Protective Equipment (PPE), training and enforcing personnel to wear the prescribed PPE, conducting work area safety inspections (including correcting deficiencies), and all other related safety requirements are the sole responsibility of the Contractor.

All work involved in the preparation and implementation of the safety program will not be measured for separate payment, but will be considered subsidiary to the lockout/tagout bid item.

300-3.3 PRECONSTRUCTION MEETING.

A preconstruction meeting will be held with the Airport, FAA, Engineer and Contractor, prior to any work. Complete submittals and shop drawings will be submitted at this time for review. An equipment procurement schedule will be provided by the Contractor with an anticipated field construction start date. The progress construction schedule will be submitted for review each week and shall outline all installation, testing and demolition work.

300-3.4 GENERAL. In general, the various electrical equipment and material to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards so as to complete the work in a neat and satisfactory manner. The following is a general outline concerning the running of various systems and is to be excepted where the drawings or conditions at the buildings necessitate deviating from these standards.

The drawings and specifications are complementary; any work required by one, but not by the other, shall be performed as though required by both.

All conduits shall be run exposed in the equipment rooms, or run concealed as indicated.

The construction details of the building are illustrated on the drawings. Each Contractor shall thoroughly acquaint himself with the details before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details.

The electrical plans do not give exact locations, etc., and do not show all the offsets, control lines, junction boxes, and other installation details. Each Contractor shall carefully lay out his work at the site to

conform to the job conditions, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide complete operating systems.

The electrical plans show diagrammatically the locations of the various electrical outlets and apparatus and the method of circulating and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, etc., by measurements at the buildings, and in cooperation with other crafts, and in all cases shall be subject to the approval of the Engineer. The Engineer reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

These Specifications and the accompanying Drawings are intended to cover systems which will not interfere with the structure of the buildings, which will fit into the several available spaces, and which will insure complete and satisfactory systems. Each bidder shall be responsible for the proper fitting of his material and apparatus into the buildings.

Should the particular equipment which any bidder proposes to install require other space conditions than those indicated on the Drawings, he shall arrange for such space with the Engineer before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such changes at the Contractor's expense.

Should the particular equipment which any bidder proposes to install require other installation methods, such as larger light base junction structures, etc., he shall include all such equipment and appurtenances in his bid. Should changes become necessary on account of failure to coordinate equipment requirements and comply with this clause, the Contractor shall make such changes at the Contractor's expense.

The Contractor shall be responsible to see that each party furnishes electrical equipment which meets the electrical requirements specified herein and that all systems work together to produce the specified operation.

Where two or more units of the same kind or class of equipment are required, these shall be products of a single manufacturer; however, the component parts need not be the products of one manufacturer.

Each Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these Specifications and Plans, which shall be checked by the Engineer and approved before the work is started, and interferences with the structural conditions shall be corrected by the Contractor before the work proceeds.

Electrical equipment, such as switchgear, switchboards, panelboards, load centers and other power supply equipment, shall not be used as a common enclosure, pull box or junction box for routing conductors of different systems, unless the equipment is specifically designed for this purpose and indicated as such on the Plans.

All electrical equipment shall be securely mounted as indicated in the plans, as required by the contract specifications, as required by guidelines and codes, and as required by the manufacturer using hardware compliant with the environmental conditions.

Interior components of electrical enclosures shall be securely mounted using appropriate hardware within the enclosure. Adhesives or adhesive tapes/strips are not allowed and are prohibited.

Electrical components, including but not limited to, relays, circuit boards, electronics, etc, shall be installed within approved enclosures.

The Contractor shall keep ends of conduits, including those extending through roofs, equipment and fixtures covered or closed with caps or plugs to prevent foreign material from entering during construction.

Where portions of raceways are known to be subjected to different temperatures, where condensation is a problem, and where passing from interior to exterior of a building, the portion of raceway or sleeve shall be filled with an approved material to prevent the circulation of air, prevent condensation, and prevent moisture entry. Sealing of raceways shall not occur until after the conductors and cables have been installed, tested and accepted by the Engineer.

The Contractor shall install any temporary lines and connections required to maintain electric services and safely remove and dispose of them when complete.

All temporary wiring shall conform to OSHA standards. Remove temporary services when work is complete. Any damage to electrical equipment caused by the Contractor shall be repaired at no cost to the Owner.

All non-current carrying parts and neutrals shall be grounded as indicated on the Drawings or as required by the Codes.

White and/or gray outer finish conductors may only be used as grounded conductors or neutral conductors in accordance with NEC.

Install insulated green equipment grounding conductors with all feeder and branch circuits.

Provide separate insulated equipment grounding conductors from grounding system to each electrical equipment, telecommunication equipment, other special electrical system equipment, and appurtenance item location in accordance with NFPA 70 and other applicable standard requirements.

The bidder shall inspect the site, thoroughly acquaint himself with conditions to be met and work to be accomplished. Failure to comply with this shall not constitute grounds for any additional payments.

Where electrical equipment is installed that causes electrical noise interference with other systems either existing or installed under this contract, the offending equipment shall be equipped with isolating transformers, filters, reactors, shielding, or any other means as required for the satisfactory suppression of the interferences, as determined by the Engineer.

All junction boxes, expansion joints, flexible connections, instruments and similar items requiring servicing or repairs shall be installed in an accessible location.

All salvage and equipment removed by the work shall remain the property of the Owner. Material removed from the project shall be stored on the project site where and as directed. Debris shall be removed from the job site and disposed of by the Contractor.

The Contractor shall maintain his work area clean and orderly at all times. Debris shall be removed promptly. The electrical system shall be thoroughly cleaned inside and outside of all enclosures to remove all metal shavings or other work debris, dust, concrete splatter, plaster, paint and lint.

The Contractor shall do all excavating and backfilling made necessary by electrical work and shall remove all surplus or supply any earth required to establish the proper finished grade.

The Contractor shall do all cutting and patching made necessary by electrical work, but in no case shall he cut through or into any structural member without written permission of the Engineer.

All steel conduits, supports, channels, fittings, nuts, bolts, etc. shall be galvanized, corrosion-resistant type unless otherwise noted.

An approved anti-seize compound shall be used on all threads to prevent equipment and thread damage.

Equipment shall be installed in accordance with manufacturer's recommendation. Make all final electrical connections and coordinate all items with other trades.

Correct unnecessary damage caused due to installation of work, brought about through carelessness or lack of coordination. All openings, sleeves, and holes to be properly sealed, fire proofed and water proofed. Any water leaks arising from project construction will be immediately corrected to the satisfaction of the Owner and the Engineer.

The soil surrounding all installed equipment shall be sterilized a distance of 2 feet, in all directions, with the soil sterilant Pramitol or other sterilant approved by the Engineer.

300-3.5 DUCT AND CONDUIT. Conduits shall be galvanized rigid steel unless otherwise indicated or specified. Refer to one-line diagram conduit notes for specific requirements.

Conduit runs shall be one trade size continuously with no reducers allowed. Changing of conduit size is only permitted at manholes, handholes, and boxes and conduit bodies used as outlet, device, junction, or pull boxes, including approved, listed fittings with removable covers.

Use an approved, listed adapter/coupling to convert to other types of conduit. Reducer couplings are not allowed.

For underground service entrance, feeder and branch circuit raceways, offsets and bends over 30 degrees and elbows in Schedule 40 PVC conduit runs shall be Schedule 80 PVC conduit. Underground service entrance PVC conduits shall be concrete encased unless otherwise noted. Underground PVC conduits shall be concrete encased under driveways, roadways, parking lots and other paved areas.

Non-encased conduits shall convert to concrete encased ducts under all paved areas and shall extend at least 3 feet beyond the edges of the pavement unless otherwise noted.

The Contractor shall provide a staked centerline or offset for the duct and manhole system - utilizing the drawings and a site inspection of the existing grounds, grades and utility crossings. The Owner and Engineer shall approve the staking plan that shall be indicated on a drawing submitted for approval before starting any excavation for the ducts. The staking plan shall indicate the proposed location, elevation and dimensions of manholes and handholes. The Engineer reserves the right to adjust duct, manhole and handhole locations and elevations before installation at no additional cost to the Owner.

The bottom surface of trenches shall be essentially smooth and free from coarse aggregate.

Install grounding-and-bonding type bushings and bonding jumpers on all service entrance conduits and on all feeder and branch circuit conduits.

Use conduit bushings at each conduit termination. Where No. 4 AWG or larger ungrounded wire is installed, use insulated bushings.

When EMT is allowed, utilize only steel compression fittings. Die-cast and set-screw fittings shall not be used.

Use double lock nuts at each conduit termination. Use weather tight hubs in damp and wet locations. Sealing lock nuts shall not be used.

Grounding continuity to rigid metal conduit shall be accomplished by grounding bushings/adapters with lugs for connection to grounding counterpoise and/or grounding electrode conductor as defined by NEC.

All exposed wiring shall be run in not less than 1/2 inch (12 mm) galvanized rigid steel conduit. All conduits shall be installed to provide for drainage. Conduit shall be attached to wooden structures with galvanized

pipe straps and fastened with galvanized wood screws not less than No. 8 nor less than 1-1/4 inches (31 mm) long. There shall be at least two fastenings for each 10-foot (3 m) length.

Existing ducts may require clearing before use. It is the responsibility of the Contractor to locate the existing ducts, identify empty or partially empty conduits and clear the conduits as required. Where new cable is to be installed in existing duct, the full length of the duct shall be cleared of debris by mechanical means before the installation of the new cable. Acceptable methods of clearing existing ducts include "hydro-jetting" and "roto-rooting." All existing cables in each re-used duct shall be replaced for the length of the duct and properly spliced in a method approved by the Engineer. Clearing of existing duct banks or conduits is incidental to the cable pay item.

Dedicated ground rods shall be installed and exothermically welded to the counterpoise wire at each end of a duct bank crossing under pavement.

For concrete markers, the impression of letters shall be done in a manner, approved by the Engineer, to effect a neat, professional appearance. The letters shall be stenciled neatly. After placement, all markers shall be given one coat of high-visibility aviation orange paint, as approved by the Engineer.

Existing concrete markers or survey pins for runway thresholds, duct/conduit/cable/splice markings, utility line markings, taxiway points of tangency markings, or other similar items shall be removed and reinstalled or replaced, depending on the project work requirements, as required by a registered professional surveyor to the satisfaction of the Owner and the Engineer.

300-3.6 JUNCTION BOXES AND CONCRETE STRUCTURES.

Junction cans shall have both internal and external ground lugs. Size (diameter) and depth shall be as specified in the plans.

Galvanized cans shall have an external ground lug for mechanical connection/bolting ground clamps bonding.

For concrete structures, each cover and frame shall be galvanized and have a spring assisted, latching mechanism allowing one individual to open the manhole hinged cover(s) using the recessed lifting handles. Covers shall be secured by stainless steel penta-head bolts.

For manholes and handholes, cables shall be well supported on the walls using heavy-duty non-metallic cable racks with multiple arms per stanchion and wide type wire ties for securing the cables. Handholes shall have at least one stanchion on each wall and manholes shall have at least two stanchions on each wall. Adjustable arms shall lock into the stanchion. Stanchion and arm lengths shall be appropriate for the manhole or handhole size and the amount of cables to be supported. At least one spare unused arm stall be installed at each stanchion position. Stainless steel hardware shall be used to securely mount and secure the cable racks to the walls.

Handhole covers shall have custom legends. Coordinate exact text with the Engineer during product submittal reviews.

300-3.7 BACKFILL, COMPACTION, AND RESTORATION. Refer to the backfill, compaction and restoration requirements within Item P-152 where other compaction requirements are specified (under pavements, embankments, etc.)

Trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Backfilling from two directions will not be allowed. No backfilling will be accomplished without the approval of the Engineer or Construction Observer. The Contractor shall ensure all trenches are

inspected prior to being covered and prior to encasement. Any uninspected trenches which are prematurely covered shall be exposed for inspection at the Engineer and Owner's convenience at no additional cost to the Owner. The Construction Observer will coordinate with the Contractor for advance scheduling of trench inspection.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

All concrete/asphalt pavement removal and repair work shall be installed as separate pay items in accordance with Specification P-101 Surface Preparation.

The subgrade below the removed pavement shall be compacted to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D2922. Subgrade preparation will not be measured for separate payment, but will be considered subsidiary to Specification P-101 Surface Preparation.

300-3.8 CABLE AND UTILITY COORDINATION. The existing and the proposed locations of lighting cable are approximate. The Contractor shall be responsible for field locating and identifying the existing lighting circuits to determine their exact routing. The Contractor shall also be responsible for maintaining the lighting systems in a working condition until the new lighting circuits have been installed and tested. The Contractor shall proactively and expeditiously accomplish this cable identification work prior to performing any modifications to the lighting circuits. Coordinate identification work with the Owner and Engineer and make all corrections, additions, etc. on the as-built drawings.

Underground cable and utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these cables and utilities on the Plans. All existing cable and utilities may not be shown on the Plans and the location of the cables and utilities shown may vary from the location shown on the Plans. Prior to beginning of any type of excavation, the Contractor shall contact the utilities, the airport maintenance staff, FAA field personnel and other organizations as required and make arrangements for the location of the utilities on the ground. The Contractor shall maintain the cable and utility location markings until they are no longer required.

The Contractor shall replace or repair any underground cable or utility that has been damaged by the Contractor during excavation to the satisfaction of the owner of the cable or utility at no additional cost to the Owner.

Specific work construction and utility cutover coordination meetings shall be held with the FAA, concerning the utility line relocation work associated with their equipment and facilities. New work including handholes, pull boxes, underground ducts/conduits, and appurtenances required shall meet the respective utility standards and be installed to the satisfaction of the utility owner and the Engineer.

300-3.9 WIRING. The Contractor shall furnish all labor and materials and shall make complete electrical connections in accordance with the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electrical Code.

Provide color coding for phase identification.

Colors for 240/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Neutral: White

Colors for 208Y/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Phase C: Blue
d. Neutral: White

Colors for 480Y/277V Circuits:

a. Phase A: Brown
b. Phase B: Orange
c. Phase C: Yellow
d. Neutral: Gray

All new electrical cable shall be marked using color-coded plastic electrical tape which is specifically designed for application on polyethylene-jacketed cable. The tape shall be applied as detailed on the Plans. Marking tape shall be Scotch 35 Vinyl Plastic tape or approved equal.

300-3.10 5 kV CABLE CONNECTIONS.

Cable splicing/terminating personnel shall be licensed electricians who have the minimum continuous experience in terminating/splicing medium voltage cable as listed in Item L-108. The qualifications for these airfield lighting cable splicers shall be submitted for review and approval by the Engineer prior to any work. The Engineer may request sample splices be performed in his presence by the proposed personnel to clearly demonstrate that they have the skill and experience to perform this work. Connector kits and cables shall be provided in sufficient quantity by the Contractor in demonstrating these qualifications at no additional cost to the Owner.

Field-attached plug-in splices using FAA certified L-823 plug and receptacle connector kits, properly sized to the cable being used, shall be installed as shown in the plans. This work shall include the taping and heat shrinking. Refer to Item L-108 for additional requirements.

As an option, the Contractor may utilize enhanced FAA certified L-823 connector kits, such as the Amerace 54Super Kit. These kits do not require taping or heat shrinking. These kits shall be installed in accordance with the manufacturer's installation requirements. Note that the mixing of connector kits is unacceptable. The Contractor shall clearly list and submit the connector kits he proposes to utilize on the project for approval prior to any field construction work, and he shall only install that type during construction unless otherwise noted by the Engineer.

300-3.11 MARKING AND LABELING. Properly identify all electrical equipment.

Wire/Cable Designation Tape Markers:

a. Indoor Dry Locations: UL Recognized Materials, vinyl or vinyl-cloth, self-adhesive, wraparound, self-laminating, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-427 with thermal transfer print type, or approved equal.

b. Outdoor Locations and Indoor Wet and Damp Locations: White polyolefin, non-adhesive, full circle, heat-shrinkable sleeve, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-342 with thermal transfer print type, or approved equal.

Properly identify all electrical equipment, including but not limited to the following:

a. Switchgear, switchboards, and control panels.
b. Main distribution panel and individual devices within it.
c. Panelboards and individual devices within it.
d. Safety switches and disconnects.
e. Contactors and lighting control center, including all branch circuits.

f. Individually mounted circuit breakers.

Use permanently attached black phenolic plates with 3/8" white engraved lettering on the face of each, attached with minimum two sheet metal screws. Starters and relays connected under this Specification shall be identified whether furnished under this Specification or under other Specifications of this contract. Plates shall be indoor or outdoor rated as required by installation location.

Panelboard identification plates shall indicate panel by identification name, voltage system, ampacity rating and type, AIC rating, and feeder source description.

Identify each receptacle, light switch, junction box, etc. with panelboard identification and circuit number. For all wiring device covers, use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

Identify fire alarm junction boxes with red covers and mechanical control junction boxes with blue covers.

Install all identification as required by current adopted editions of the NFPA 70 - National Electrical Code and NFPA 70E - Standard for Electrical Safety in the Workplace.

300-3.12 REMOVAL AND RELOCATION OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated on the Plans. Any equipment which is damaged during the removal operation shall be subject to a reduction in payment for removal of the equipment. All equipment which is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

The Contractor shall carefully relocate existing equipment as indicated in the Plans. Any equipment that is damaged during the relocation operation shall be replaced at no additional cost to the Owner.

Any existing electrical equipment, conduit, cables, etc. that is damaged during construction shall be replaced at no additional cost to the Owner to the satisfaction of the Owner and the Engineer.

300-3.13 CERTIFICATION AND PERFORMANCE. Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-3.14 AS-BUILT DRAWINGS. Before work is started, the Contractor shall obtain at his expense one (1) full-sized set of prints for As-Built records; the Engineer will supply the tracings at printing cost to the Contractor.

The Contractor shall locate all underground and concealed work, identifying all equipment, conduit, circuit numbers, motors, feeders, breakers, switches, and starters. The Contractor will certify accuracy by endorsement. As-Built drawings shall be correct in every detail, so Owner can properly operate, maintain, and repair exposed and concealed work.

The As-Built drawings shall indicate all control system labeling and marking.

The Contractor shall store the As-Built drawings on the site. Drawings shall not be rolled. Make corrections, additions, etc., with pencil, with date and authorization of change.

As-Built drawings must be submitted to Engineer before project will be accepted.

Minor deviations from the Plans and Specifications shall be as approved by the Engineer.

Upon completion of the installation, the Contractor shall adjust the systems to the satisfaction of the Engineer.

300-3.15 TESTING.

General Electrical Testing: Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification and certify compliance with test parameters. Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest. Perform infrared scan tests and inspections of service and power distribution equipment at the respective hangars and provide reports. Electrical equipment will be considered defective if it does not pass tests and inspections. Reports shall include notations of deficiencies, remedial action taken and observations after remedial action.

System and Equipment Testing: All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Airport lighting equipment and special systems shall be tested in accordance with applicable FAA Advisory Circular requirements and the manufacturer's installation instructions. These tests shall also include those system requirements listed within AC 150/5340-26 Maintenance of Airport Visual Aid Facilities.

Test equipment and instruments utilized by the Contractor shall have been calibrated following the manufacturer's recommended schedule to verify their accuracy prior to performing the testing work. The Contractor shall provide instrument calibration certificates on test equipment when requested by the Engineer. Retesting work due to inaccurate or defective instruments shall be performed by the Contractor to the satisfaction of the Engineer at no additional cost to the Owner.

a. Regulator Calibration:

The Contractor shall check and calibrate both new and existing regulators utilizing the enclosed "Constant Current Regulator Calibration Report". Refer to the material section on constant current regulators for additional requirements.

New regulators are calibrated at the factory prior to shipping, while existing regulators typically need checks and calibrations on a routine basis so that they do not get out of tolerance. The intent is to check and/or calibrate these regulators using a high accuracy meter prior to energizing and placing the airfield lighting system in service.

Utilize a high accuracy true RMS ammeter with high accuracy clamp-on current probe when making these measurements (use round type probes, accuracy + or – 2% required, sized per the cable diameter and circuit ampacity to achieve the best accuracy). Adjust regulators per manufacturer's instructions to meet the output currents on each brightness step as listed in Tables 5-2 and 5-3 in AC 150/5340-26.

b. Megger Testing:

The Contractor shall perform megger testing on each existing regulator circuit prior to any work on the electrical system. This information shall be recorded and documented by the Contractor and submitted to the Engineer. The Contractor shall perform megger tests on each regulator circuit after the acceptance test period. This acceptance test information shall be recorded and documented by the Contractor and submitted to the Engineer. Megger test shall be performed in accordance with the requirements of Item L-108.

The Contractor shall submit his initial megger test reports on the enclosed "Insulation-Resistance Test Report" form prior to any work on the electrical system. This report shall be submitted to the Engineer and approved by the Owner prior to Contractor proceeding with his work.

After final acceptance testing has been completed, the Contractor shall complete and submit his final megger test reports to the Engineer and insert copies of the initial and final megger test reports in the Operation and Maintenance Manuals.

Megger testing shall be performed using an insulation meter, such as a Fluke 1507 Insulation Resistance Multimeter, Ideal 61-797 Digital Insulation Meter, or approved equal having an insulation test range up to 10 Gigohms or greater.

Insulation resistance testers for 5kV series circuits shall utilize the 1000V DC source output for testing. The test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

The Contractor shall be responsible to maintain an insulation resistance equal to minimum 80% of the initial testing value through the end of the contract warranty period. This requirement is based on AC 150/5340-26C which states that resistance values inevitably decline over the service life of the circuit and that a 10-20 percent decline per year is considered normal. Note that AC 150/5340-26C cancels AC 150/5340-26B; thus refer to the current edition of the maintenance AC for requirements in this project.

For existing circuit insulation resistance requirements, refer to "Existing Circuits" section of Item L-108.

The insulation resistance to ground for 600V rated cables shall be not less than 100 Megohms when measured per NETA standards.

The installations shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings in accordance with manufacturer's requirements. Testing equipment shall be furnished by the Contractor.

c. Ground Rod Impedance Testing:

The enclosed "Ground Rod Impedance Test Report" form shall be used and testing shall be performed in the presence of the Engineer.

As-Built drawings shall indicate the location of all installed ground rods. Each ground rod shall have a unique identifier that corresponds with its submitted ground impedance test report.

Three-pole fall-of-potential testers that can measure the ground resistance of a ground rod using auxiliary electrodes (staked testing), such as a Fluke 1621 Earth Ground Tester, shall be used for testing individual dedicated equipment ground rods at fixtures

and equipment, or for testing isolated counterpoise ground rods not yet connected to the counterpoise wire.

Clamp-on testers that can measure the ground resistance of a ground rod without using auxiliary ground rods (stakeless testing), such as a Fluke 1630 Earth Ground Clamp Meter or approved equal, shall be used for testing counterpoise ground rods which have already been connected to the counterpoise wire, or ground ring ground rods which have already been connected to the established ground ring system.

Ground impedance test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

If the ground rod's impedance exceeds 25 ohms, an additional rod shall be driven in a location suitable and approved by the Engineer. However, the additional rod must satisfy the requirements of NEC 250.53 and not be less than 6 feet away from any other ground rod electrode. Additional ground rods shall not be measured for separate payment but shall be considered subsidiary to the counterpoise or respective equipment pay item.

The Contractor shall perform additional tests if required and requested by the Engineer at no additional cost.

The Contractor shall coordinate with the resident Engineer to approve tests daily before proceeding. The Contractor shall fill out a separate test report for each date. Test reports shall be submitted weekly to the Engineer.

300-3.16 INSPECTION FEES AND PERMITS. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

300-3.17 WORK SUPERVISION.

State of Texas: The electrical contractor (whether the general contractor or a subcontractor) shall be a licensed contractor in the state of Texas having an electrical classification suitable for performing the work required in these contract documents.

The Contractor shall designate in writing the qualified electrical supervisor who shall provide supervision to all electrical work on this project. The minimum qualifications for the electrical supervisor shall be a master electrician as defined by the Texas Electrical Safety and Advisory Board. The supervisor or his appointed alternate possessing at least a journeyman electrician license shall be on site whenever electrical work is being performed. The qualifications of the electrical supervisor shall be subject to approval of the Owner and the Engineer.

All master and journeyman electricians shall be licensed in accordance with Texas Board Requirements. The website located at http://www.license.state.tx.us publishes the text of this statutory requirement. No unlicensed electrical workers shall perform electrical work on this project. Apprentice electricians in a ratio of not more than one apprentice per journeyman electrician will be allowed if the apprentices are licensed and actively participating in an apprenticeship program recognized and approved by The State of Texas.

Refer to specification section L-108-2.5 "Splicer Qualifications" for additional requirements.

300-3.18 TRAINING. The training classes shall be coordinated with the Owner and Engineer in advance of the final acceptance testing. Comprehensive operational and maintenance training materials shall be provided by the equipment manufacturer and the Contractor (see section 2.3 OPERATION AND MAINTENANCE DATA).

a. Operations and Maintenance:
   (1) Amount and length: 3-4 hours
   (2) Class size: 3-4 employees
   (3) Location: GA Terminal.
   (4) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (5) Training materials: O&M Manuals
   (6) Provide hands on troubleshooting specifics.

b. Preventive Maintenance Program Recommendations
   (1) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (2) Discuss failure scenarios and what to do.
   (3) Provide technical assistance points of contact and phone numbers.

Schedule the training with the Owner at least 10 days in advance and notify the Engineer.

Provide hands-on demonstrations and training of equipment components and functions, including adjusting, operating and maintaining the lighting equipment and systems. Coordinate the training schedule with the Owner in advance, so that the Owner may record the training if desired. Provide 4-hours training for the operational personnel and 4-hours training for the maintenance personnel.

METHOD OF MEASUREMENT

300-4.1 The quantity of lockout/tagout and constant current regulator calibration procedures to be paid for shall consist of all lockout/tagout procedure work and all constant current regulator calibration work completed in place, accepted and ready for operation. This item does not include measurement for constant current regulator equipment.

300-4.2 Temporary conduits shall be measured by the linear feet (meter) of conduits installed, including strapping for securing to pavement or turf, flagging, connections to existing stake or base mounted lights, and for pressure treated lumber used to protect the conduit where it crosses a vehicular access, all measured in place, completed, and accepted.

BASIS OF PAYMENT

300-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures – per Lump Sum
Item SS-300-5.2	Non-Encased, Schedule 80 PVC Conduit, 1-Way 1"C, Mounted to Surface for Temporary Electrical Connection – per Linear Foot

MATERIAL REQUIREMENTS

Fed.Spec.J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)

Fed. Spec. W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid
Fed. Spec. W-P-115	Panel, Power Distribution
Fed. Std. 595	Colors
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514	Fittings for Conduit and Outlet Boxes
Underwriters Laboratories Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
CFR 1910	Occupational Safety and Health Regulations
CFR 1926	Safety and Health Regulations for Construction
ANSI/IEEE C2	National Electrical Safety Code
NFPA 70	National Electrical Code (NEC)
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
29 CFR 1910	Occupational Safety and Health Standards (OSHA)
29 CFR 1926	Safety and Health Regulations for Construction
Jaquith Industries, Inc.	The Design, Installation, and Maintenance of In-Pavement Airport Lighting

FAA ADVISORY CIRCULARS

AC 150/5300-13	Airport Design
AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821 Panels for Control of Airport Lighting

AC 150/5345-5	Specifications for Airport Lighting Circuit Selector Switch
AC 150/5345-7	Specification for L-824 for Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Standard for Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853 Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Base and Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Taxiway and Runway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Isolation Transformers for Airport Lighting Systems
AC 150/5346-49	Specification L-854, Radio Control Equipment
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program
AC 150/5345-56	Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

END OF ITEM SS-300

CONSTANT CURRENT REGULATOR CALIBRATION REPORT

Standard Requirements: FAA AC 150/5340-26 (latest edition) Maintenance of Airport Visual Aid Facilities

Owner / Sponsor: _____ Engineer: Garver, LLC _____

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date: _____

Weather / Site Conditions: _____ Last Two Weeks of Rain: _____ inches

Constant Current Regulator #: _____ Serves: _____

	Completed	Comments
1. Check all control equipment for proper operation.	☐	_____
2. Perform short-circuit test. Record results and recalibrate if necessary.	☐	_____
3. Perform open-circuit test on regulators with open circuit protection. Open circuit protective device should de-energize the regulator. Record results.	☐	_____
4. Check and record regulator input voltage and current.	☐	_____
Input Voltage: _____ Input Current: _____		
5. Check and record regulator output load. (ONLY if regulator has monitoring package)	☐	_____
Volt-Amperes: _____		
6. Check and record output current on each brightness step. If output current is outside of the allowable range, adjust the regulator's on-board potentiometer to re-calibrate the output current within the allowable range. Re-record the new output current on this form.	☐	_____

3-Step CCR: B10: _____ B30: _____ B100: _____

5-Step CCR: 1: _____ 2: _____ 3: _____ 4: _____ 5: _____

Nominal:	4.8A	5.5A	6.6A	2.8A	3.4A	4.1A	5.2A	6.6A

Tested By: _____ (Signature and Date)

Test Equipment: _____ (Manufacturer and Model No.)

Engineer Witness: _____ (Signature and Date)

Owner / Sponsor Witness: _____ (Signature and Date)

INSULATION RESISTANCE TEST REPORT

Owner / Sponsor:_____ Engineer: Garver, LLC

Airport:_____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date Initial / Final Tests: _____

Weather / Site Conditions (Initial Test): _____ Last Two Weeks of Rain:_____inches

Weather / Site Conditions (Final Test): _____ Last Two Weeks of Rain:_____inches

		Initial Test Results		Final Test Results	
	Circuit Designation and Color Code	Regulator Size (kW)	Megger Reading Before Field Work (Megohms)	Regulator Size (kW)	Megger Reading After Field Work (Megohms)
1					
2					
3					
4					
5					
6					
Tested By:					
Test Equipment:					
Engineer Witness:					
Owner/Sponsor Witness:					

Provide signature/date and manufacturer/model no. as required in the fields above.

Initial Test Record – Owner Disposition

Owner / Sponsor: _____ (Signature and Date)

Check one only: ☐ Proceed with Installation ☐ Hold

GROUND ROD IMPEDANCE TEST REPORT

Owner / Sponsor: _____ Engineer: Garver, LLC

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Date: _____ Weather / Site Conditions: _____

Fall-of-Potential Style Tester (F):
Manufacturer: _____ Model #: _____

Clamp-On Style Tester (C):
Manufacturer: _____ Model #: _____

Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)	Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)

Tested By:	
Engineer Witness:	

Provide signature/date in the fields above.

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CABLE PULLING TENSION VALUES LOG

Owner / Sponsor: _____ Engineer: Garver, LLC

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Date: _____ Weather / Site Conditions: _____

Dynamometer Manufacturer/Model #: _____ Cable / Wire Manufacturer: _____

From / To Locations	Wire/Cable Size	Length of Pull	Pull Method	Maximum Value	Measured Value
Tested By:					
Engineer Witness:					

Provide signature/date in the fields above.

Page _____ of _____

ITEM SS-301 ELECTRICAL DEMOLITION WORK

DESCRIPTION

301-1.1 This item shall consist of the removal and satisfactory disposal of existing runway and taxiway edge lights, in-pavement lights, guidance signs, markers, manholes, handholes, junction structures, racks, pads, equipment, poles, towers, shelters, and other incidentals, all of which are not designated or permitted to remain, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. This work shall include the removal of indicated equipment, materials, and incidentals necessary for a complete item removal, including all restoration work, as a completed unit to the satisfaction of the Engineer.

Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

301-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

MATERIALS

301-2.1 All backfill and repair materials used in electrical demolition, repair and restoration work shall comply with the referenced specifications and be approved by the Engineer.

Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

CONSTRUCTION METHODS

301-3.1 GENERAL. No demolition shall be started until the removal and/or relocation work has been laid out and approved by the Engineer. All material shall be disposed of off-site. All hauling and disposal will be considered a necessary and incidental part of the work. Hauling cost shall be considered by the Contractor and included in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor shall remove all existing underground cable, which is unused or rendered unusable by this project, when such is exposed or made accessible during the course of this work. All such wiring removed shall become property of the Contractor and shall be immediately removed from the project. Wiring in conduit shall be removed as indicated or if new wiring is shown to be installed in its place. Existing wiring shall not be reused or reinstalled.

Wiring not exposed shall be abandoned in place, if a reasonable effort will not remove it. No measurement or payment will be made for this cable removal work. Damage to turf or other systems will not be permitted in order to salvage or retrieve existing cable.

Any damage to electrical equipment, systems, structures, conduits, cables, and accessories or other utilities, designated to remain in place, shall be repaired or replaced expeditiously at no additional cost to the Owner and to the satisfaction of the Owner and Engineer.

Holes, ditches, or other abrupt changes in elevation caused by the removal operations that could obstruct drainage or be considered hazardous or unsightly shall be backfilled, compacted, and left in a workmanlike condition.

Trenches or voids resulting from the removal or demolition of existing electrical equipment or other structures shall be filled with approved material placed in layers in accordance with Item P-152.

Concrete foundations and pads to be removed shall be obliterated full depth.

301-3.2 REMOVAL AND/OR RELOCATION OF LIGHT FIXTURES AND EQUIPMENT. Light fixtures and other equipment which are to be removed shall be carefully excavated. All concrete bases and concrete anchors shall be removed by the Contractor. The removed lights, guidance signs, isolation transformers and wiring harnesses shall then be given to the Owner, or properly disposed of if so directed by the Owner. The ground in the area of the removed lighting equipment shall be backfilled and properly compacted. Light fixtures and equipment which are to be relocated shall be stored on site and reinstalled with new lamps, new transformers, and all other new required accessories as indicated in the plans.

301-3.3 REMOVAL OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated in the plans. Any equipment that is damaged during the removal and/or relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment. All equipment that is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

Any equipment that is damaged during the relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment.

Any equipment that is damaged during the relocation operation shall be repaired or replaced by the Contractor at his expense to the satisfaction of the Owner and Engineer.

METHOD OF MEASUREMENT

301-4.1 The quantity of existing wind cones, removed, to be measured under this item shall be the number of wind cones removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.2 The quantity or existing segmented circle marker systems, removed, to be measured under this item shall be the number of segmented circle marker systems removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.3 The quantity of existing lights or guidance signs, removed, to be measured under this item shall be the number of each complete unit removed, and accepted by the Engineer.

This item shall include removing and storing the existing equipment as directed by the Engineer.

Where the light base and concrete structure are indicated to be removed or demolished, the item shall include restoring the area to match existing, including removing the complete concrete item, filling and tamping all holes with earth, and clearing and leveling the site.

Where the light base and concrete structure are to remain, a new blank cover shall be installed for protecting the light base during the construction work. Blank covers shall be removed when the existing equipment is reinstalled and given to the Owner after completion of construction work in the respective area.

BASIS OF PAYMENT

301-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-301-5.1	Existing Concrete Encased, 2'Wx2'L Electrical Handhole, Removed – per Each
Item SS-301-5.2	Existing Concrete Encased, 3'Wx3'L FAA-Style Electrical Handhole, Removed – per Each
Item SS-301-5.3	Existing Stake Mounted Edge Light, Removed – per Each
Item SS-301-5.4	Existing Base Mounted Edge Light, Removed – per Each
Item SS-301-5.5	Existing Base Mounted Edge Light, Removed, Base to Remain – per Each
Item SS-301-5.6	Abandoned Wind Cone Base, Removed – per Each
Item SS-301-5.7	Existing Wind Cone and Foundation, Removed – per Each
Item SS-301-5.8	Existing Segmented Circle Marker System, Removed – per Each
Item SS-301-5.9	Abandoned Sign Base, Removed – per Each
Item SS-301-5.10	Existing Base Mounted Guidance Sign, Removed – per Each
Item SS-301-5.11	Existing Base Mounted Guidance Sign, Removed, Base to Remain – per Each
Item SS-301-5.12	Concrete Encased Duct Bank Removal – per Linear Foot

END OF ITEM SS-301

ITEM SS-305 DIRECTIONAL BORING

DESCRIPTION

305-1.1 This item shall consist of furnishing and installing conduits via directional boring methods, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The borings shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. It shall also include all trenching, backfilling, mandreling installation of drag wires and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of conduit and/or cables, to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

305-2.1 GENERAL. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

All equipment and materials covered by these specifications shall be new and meet applicable manufacturer's standards.

Polyethylene conduits shall conform to SDR 11 type.

The Contractor shall submit a statement of qualifications including previous similar jobs experience in directional boring for the last three (3) years. Previous job description work shall include length, pipe type, pipe size(s) and soil type,

The Contractor shall submit complete shop drawings outlining his directional boring method (including drilling fluids, additives and mixtures), drill rod, bore size, materials, equipment and safety requirements to be utilized on this specific project, for review and approval by the Engineer.

All materials shall be inspected at the job site for damage. Defective materials shall be removed from the job site and replaced with new materials prior to the work.

CONSTRUCTION METHODS

305-3.1 GENERAL. Boring shall be done by pilot hole method using fluid as a lubricant only and shall not undermine the surrounding ground. Jetting will not be permitted. The Contractor shall use a guidance system to assure knowledge of the bore location while making the bore. The Contractor will not be paid for unusable sections.

Locate and clearly mark all utilities prior to start of excavation or drilling. The Contractor will be responsible for damage to pavements, utilities, or other structures caused by his activity. The Contractor shall repair, at his own expense, any damaged pavement, utility, or other structure as directed by the Engineer or the owner of the utility or structure. The Contractor shall not excavate to find a bored casing without specific approval and definitions of limits. No payments will be made for excavation and repair except as shown on drawings.

The Contractor shall inspect the locations where the encasement structures are to be installed and familiarize himself with the conditions under which the work will be performed and with all necessary details for orderly prosecution of the work. The omission of any details in the Plans and herein for the satisfactory installation of the easement in its entirety shall not relieve the Contractor of full responsibility for the installation.

Directional bores shall be a minimum 48" below the existing base. For this project, the existing pavement shall be considered 12" in depth and the existing base shall be considered 12" in depth. Therefore, the overall depth shall be a minimum 72" below the surface of the pavement. The Contractor shall utilize a beacon or other depth reading instrument to verify the depth below the runway.

The bore size shall be the minimum size for the work required. Upsizing the bore will not be allowed.

The Contractor shall utilize a walkover guidance and tracking system to assure the orientation and depth of the bore path. Depth and orientation confirmation shall occur at a minimum of every five feet of lateral distance covered.

The Contractor shall perform all excavation required to complete the work regardless of the material encountered. Excavation from the access shafts (bore pits) in excess of the required to backfill the access shafts and open ditch portion of the line shall be disposed of by the Contractor off of Airport Property.

Pits and trenches shall be constructed and maintained in accordance with the current edition of the OSHA Standard for Excavating and Trench Safety Systems. Restore ground to original conditions after work completion including seeding and topsoiling.

The access shafts (bore pits) for encasement installation shall be rectangular in plan view with the longest dimension being constructed with the direction of the pipe. The access shafts shall be constructed at a location shown on the plans.

Use a high quality drilling fluid to ensure hole stability, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Use only fluid with a composition which complies with all federal, state and local environmental regulations. Mix the drilling fluid with potable water (of proper pH) to ensure no contamination is introduced into the soil during the drilling, reaming, or pipe installation process. The Contractor is responsible for any required pH adjustments.

Disposal of the drilling fluids is the responsibility of the Contractor. Conduct disposal in accordance with all relative environmental regulations and permit requirements. No excess drilling fluids shall remain in the bore access pit or receiving pit. Immediately clean up any drilling fluid spills or overflows from these pits. All excess drilling fluids and mud shall be disposed of off Airport Property on a daily basis. Bore pits and trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Assemble the entire pipe to be installed via directional boring prior to starting pull back operations. Support the pipe to enable it to move freely and prevent damage. Install the pipe in one continuous pull. Maximum allowable tensile force imposed on the pull section is not to exceed 90 percent of the pipe manufacturer's safe pull strength. If multiple pipe sizes or materials, the lowest safe strength shall govern. Damaged pipes shall be replaced at no additional cost to the Owner.

Extend and connect pipes to junction structures as indicated. When pipe is used as a sleeve, install interior conduits as indicated and terminate the conduits with end bells as shown in the plans or as required.

Upon completion of the work, immediately remove all debris from the job site and restore the areas to original condition acceptable to the Engineer.

The Contractor shall record and document drilling logs that provide drill bit locations, both horizontally and vertically. These records shall be submitted to the Engineer and included in the O&M manual for the project.

All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

METHOD OF MEASUREMENT

305-4.1 The quantity of directional boring to be paid for under this item shall be the number of linear feet of conduit and directional boring installed with backfill, compaction, turf restoration, and appurtenances, measured in place, completed and accepted to the satisfaction of the Engineer.

BASIS OF PAYMENT

305-5.1 Payment will be made at the contract unit price per linear foot for each type and size of directional boring completed by the Contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-305-5.1 Directional Boring, 2-Way 2"C Polyethylene Conduits – per Linear Foot

END OF ITEM SS-305

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ITEM SS-310 AIRPORT LIGHTING SYSTEMS

DESCRIPTION

310-1.1 This item shall consist of furnishing and installing airport runway and taxiway edge lighting systems, retroreflective markers, guidance signs, runway centerline and touchdown zone lighting systems, other taxiway lighting systems, and other approach lighting aid systems, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The system shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. This work shall include the furnishing of all equipment, materials, services and incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

310-1.2 Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

310-1.3 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

EQUIPMENT AND MATERIALS

310-2.1 GENERAL.

a. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

b. For pre-cast or prefabricated concrete encased light base installations, the Contractor shall submit and coordinate the construction of the proposed pre-cast units with the Engineer onsite to review and approve the construction process. The Contractor shall submit his proposed installation process for review and approval by the Engineer. The Contractor shall provide additional items and work if required and requested by the Engineer for the construction and installation of the pre-cast units at no additional cost to the Owner.

Pre-cast or prefabricated concrete encased light bases may only be assembled at the Contactor's staging area at the airport in order to allow the Engineer to check and approve all such construction items. Pre-cast bases assembled offsite will not be allowed.

c. For in-pavement fixture installations, the Contractor shall submit his proposed installation method and technique for correct placement and alignment of all lights for review and approval prior to any work.

In-pavement lighting systems will require an experienced electrical supervisor and experienced installation team, including licensed surveyor. This includes the complete installation, layout, and coordination with paving joints and paving work.

310-2.2 LIGHT FIXTURES. Airfield lights shall be supplied with all features and accessories including isolation transformers, light bases, base covers, safety ground rods, concrete pads and incidentals required for a complete installation as defined in these Specifications and as shown on the plans.

a. Medium Intensity Taxiway Lights (MITL):

(1) Taxiway edge elevated lights shall be L-861T(L), LED lamp, omnidirectional blue lens.

(2) Taxiway edge in-pavement lights shall be L-852T(L), LED lamp, Class 2, Style 3

(low profile), omnidirectional blue lens, mounted on a 12" diameter L-868B light base.

310-2.3 LAMPS. Lamps for elevated edge lights shall be LED type as specified.

310-2.4 SPARE EQUIPMENT INCLUDING LAMPS, FIXTURES, AND SPARE SIGN REPLACEMENT COMPONENTS. Provide 10 percent spare lamps of each type installed for lights and signs, minimum quantity of 6 required. Spare lamps shall not be measured for separate payment but shall be considered subsidiary to the light fixture and guidance sign pay items.

Provide 10 percent spare fixtures of each type installed for lights. Provide 10 percent spare sign replacement components of each type installed for signs. Spare fixtures and spare sign replacement components shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

Provide the following spare fixtures:

- 8 L-861T Taxiway Edge Lights
- 1 L-852T Taxiway Edge Ligbt
- 1 set of spare replacement components for a 2-Module, Size 2 L-858 guidance sign
- 1 set of spare replacement components for a 3-Module, Size 2 L-858 guidance sign

a. A spare elevated LED fixture unit shall be one complete, ready-to-install fixture, including the coupling, column, head housing assembly, cordset, LED power supply assembly, LED assembly, and lens assembly.

b. A spare in-pavement LED fixture unit shall be one complete, ready-to-install fixture, including the top cover assembly, bottom pan assembly, cordset, LED power supply assembly, and LED assembly.

c. A spare sign replacement component unit shall include the LED light tube assembly and LED power supply assembly.

The spare lamps, spare fixtures and spare sign replacement components shall be delivered and stored as directed by the Owner, with transmittal receipt signed by Owner's representative. A signed copy shall be forwarded to the Engineer with an additional signed copy placed in the O&M manuals.

310-2.5 GUIDANCE SIGNS. Guidance signs shall be L-858(L), meeting the criteria set forth in AC 150/5345-44, Specification for Taxiway and Runway Signs, and suitable for base mounting. Each unit shall be furnished with the required panels, mounting assemblies, frangible couplings, transformer, intensity control, identification tag, metal tethers, fasteners and safety ground rods.

Style 2 and Style 3 signs shall meet the luminance requirements in AC 150/5345-44 throughout the current ranges of the associated series circuit.

Guidance signs shall have an integral on/off switch for airport maintenance use.

Signs shall be furnished with permanent type nameplates that are both weather and sunlight resistant. Nameplates which are completed with ink markers or similar methods will not be accepted.

Refer to the guidance sign index in the Plans for information on each sign's size, style, class and mode.

The complete sign installation shall be designed to withstand a 200-mph wind load.

Guidance signs shall be Size 2 (15" Legend), Style 2 (3-step circuit), Class 1 (operation range from -4 degrees F to 131 degrees F), Mode 2 (withstand wind loads of 200 mph).

310-2.6 ISOLATION TRANSFORMERS. New isolation transformers shall be Type L-830 and have a

wattage rating suitable for the wattage of the fixture and sign lamps. The transformer shall be listed in FAA Circular AC 150/5345-47.

Provide 10 percent spare isolation transformers of each type installed for lights, signs and other equipment. Spare transformers shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

310-2.7 FIELD LIGHTNING ARRESTOR. New series circuit field lightning arrestors shall be installed on the airfield series circuits to reduce the risk of lightning damage to the circuits, including cables, isolation transformers and field/vault lighting equipment. The arrestor assembly shall consist of a NEMA 6P rated metal enclosure, using MOV components, rated for 5,000 volts continuous operating voltage with 25,000 A peak surge current, having a minimum 2 giga-ohm insulation resistance, with L-823 connectors, The arrestors shall be designed specifically for protecting 5 kV airfield series circuits and shall be manufactured by ADB, Astronics or Liberty Airport Systems.

Provide 10 percent spare lightning arrestor units, minimum quantity of 2. Spare arrestors shall not be measured for separate payment but shall be considered subsidiary to the respective arrestor pay items.

CONSTRUCTION METHODS

310-3.1 GENERAL. The installation and testing details for the lighting system shall be as specified in the applicable advisory circulars.

The Contractor is responsible for all surveying and measurement which is required to accurately position and aim airfield lighting systems and equipment.

Airfield lighting systems and equipment that are improperly installed shall be removed and re-installed correctly as directed by the Engineer. No payment will be made for the removal and reinstallation of airfield lighting systems and equipment improperly installed. All remedial work shall be to the satisfaction of the Engineer.

310-3.2 LIGHTING LAYOUT PLANS. The Contractor shall stake the airfield lighting systems, prior to installation of any trench, cable or lighting apparatus. The intent is to stake the installation at the locations indicated, noting any deviation from plan dimensions to the Engineer prior to installation. The Contractor shall obtain the services of an experienced and licensed surveyor to perform this work.

The Engineer shall provide electronic CADD files to the Contractor for this staking work. The Contractor shall stake the items and his surveyor shall provide a CADD file submittal back to the Engineer. Based upon this submittal, the Engineer shall coordinate and provide directions on any adjustments necessary to meet existing field condition requirements and comply with FAA Advisory Circular requirements on the layout and spacing of equipment.

The Contractor and his surveyor shall then make any electronic CADD file spacing adjustments and/or field staking adjustments prior to installation at no additional cost to the Owner.

Refer to General Provisions Section 50 Control of Work for additional construction layout and staking requirements.

310-3.3 PLACING THE EQUIPMENT. The equipment shall be mounted on concrete pads as shown in the plans. Secure the equipment and make all final connections.

310-3.4 MOUNTING, LEVELING, AND AIMING. The concrete support to which the equipment is fastened shall be accurately leveled before mounting the equipment. The units shall be properly aimed, as recommended by the manufacturer of the supplied equipment. This adjustment shall be accomplished using

factory-approved aiming devices and techniques.

310-3.5 PLACING LIGHTS. All equipment shall be installed at locations indicated in the plans. Lights shall be laid out by locating the two control points by station as indicated on the plans and measuring the indicated individual separation distances. Light bases shall be located within 1 inch +/- longitudinally and 0.5 inches +/- transversely of the location indicated unless deviation is approved by the Engineer. Excavation for installation of light bases shall be backfilled with at least 4 inches of granular leveling course, as approved by the Engineer. Fixture height shall be as indicated on the Drawings.

For pre-cast or prefabricated concrete encased light base installations, a leveling course of sand shall be placed in the bottom of the excavated hole, sufficient for accurately installing, leveling and placing the lights in accordance with the requirements in this specification and AC 150/5340-30. Concrete encased light bases shall be allowed to cure a minimum of 7 days prior to installation.

Utilize a bubble level device to level all light fixtures in the horizontal light plane during the day, and then check at night to ensure uniformity in light output.

Provide factory-approved alignment tools and aiming devices to properly level and align fixtures as required by the FAA Advisory Circulars and manufacturer's installation instructions. After all light fixture installations are completed and accepted by the Engineer, these alignment tools and aiming devices shall become property of the Owner and shall be delivered and stored as directed by the Owner.

310-3.6 PLACING SIGNS. All signs shall be installed at the approximate location indicated in the plans. The specific requirements for sign location are specified in AC 150/5340-18, Standards for Airport Sign Systems. Specific requirements of this AC are also shown on the Plans. Signs shall be located within 1 inch +/- longitudinally or 0.5 inches +/- transversely of the required location unless deviation is approved by the Engineer. The locations for the signs shall be staked by the Contractor and approved by the Engineer before installation begins.

Provide single module signs with one tether. Provide multiple module signs with a tether at both ends.

310-3.7 PLACING FIELD LIGHTNING ARRESTORS. All field lighting arrestors shall be installed at locations indicated in the plans, typically about every 2,000 feet around the series circuit. The arrestors shall be installed in base cans or handholes as noted on the plans. Provide a minimum #4 AWG copper ground wire to connect the arrestor ground lug to dedicated ground rod outside the base can or handhole on the pavement side of the equipment. This ground rod shall be connected to the counterpoise system using exothermic welds only. Provide a permanent type marker at each arrestor listing the date it was placed in service.

310-3.8 TRANSFORMER INSTALLATION. The transformer for base mounted fixtures shall be placed inside the base. The transformer for stake mounted fixtures shall be located uniformly as shown on the plans. The primary cable connections shall be made with L-823 connectors as described in Item L-108 and have 3 feet of slack cable. The secondary leads connected to the lamp leads by means of a disconnecting plug and receptacle provided with the unit, and this joint shall not be taped. The secondary joint shall be fastened with a holding ring provided for this purpose.

310-3.9 UNIT ASSEMBLY. All electrical equipment, including edge lights, guidance signs and other visual aid units shall be assembled in accordance with the manufacturer's installation procedures. Anti-seize compound shall be used on all screws, nuts, and threads, including frangible coupling threads. If coated bolts are used (ceramic metallic/fluoropolymer coating), then do not apply anti-seize compound.

Provide and install all spacers, shims, and gaskets as required, and verify they are in place before installing the light fixture on the base.

Bolts and washers for new and existing bases shall be new. Do not reuse existing hardware. The minimum thread engagement into top flange of the base shall be 0.5 inches.

For in-pavement light fixtures, provide Nord-Lock NL 3/8 stainless steel 2 part locking washers or approved equal, as required by the manufacturer.

Coordinate recommended torque values with the light fixture manufacturer, light base can manufacturer, stainless steel bolts and hardware used, and exact anti-seize compound used, in order to prevent light base thread damage. Utilize a dial-type torque wrench for accuracy and to prevent over-tightening bolts. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall submit complete installation method shop drawings and calculations to determine the proper torque requirements for review and approval by the Engineer prior to any field removal or installation work for in-pavement light fixtures.

When installing new or existing light fixtures on existing bases, the following work shall be performed for the removal and reinstallation work:

a. Remove all bolts including any that are frozen or broken. If necessary, drill out and tap for new bolt. If the can threads are galled but usable, clean threads with a tap.
b. Remove the light, base plate, transformer, and any foreign object that may be inside the can.
c. Remove the old cable, mandrel the conduits, and shop-vacuum out the can clean.
d. Install the new cable, connectors, transformer, gasket, bolts, and other required appurtenances per the fixture type and its location in accordance with FAA Advisory Circular requirements and manufacturer's requirements.
e. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall obtain complete installation manuals for the new airfield lighting equipment and the existing equipment to be reinstalled prior to any removal or installation work. Copies of these manuals shall be maintained in 3-ring binders within the Contractor's onsite field office.

In-pavement light fixtures that are installed too high will require their complete removal and reinstallation at no additional cost to the Owner. In-pavement fixtures shall be provided with all spacers, shims, gaskets and other appurtenances for complete installations that comply with FAA Advisory Circular requirements and manufacturer's installation instructions. All assemblies and work shall be to the satisfaction of the Engineer.

310-3.10 IDENTIFICATION NUMBERS. An identifying number shall be assigned to each light and sign in accordance with the plans or as approved by the Engineer and Owner. This number shall be imprinted with reflective black with 1/2" letters on a non-corrosive metal disc 2" minimum diameter and attached to the pavement side of the fixture with a metal screw.

310-3.11 TEMPORARY AIRFIELD LIGHTING. Refer to the Airfield Lighting Phasing Plans and Details for additional requirements. Existing lighting circuits shall remain operational by use of temporary circuits. New lighting circuits shall also be connected and remain operational by use of temporary circuits. This item shall include all work to maintain the existing and new lighting circuits during construction and allow all taxiways and runways in operation to remain lighted, including that portion through the construction area, as indicated in the Phasing Plans and as directed by the Engineer.

The Contractor shall perform initial field work including location and verification of existing circuits and submit plans for the temporary airfield lighting required in each work phase, for review and approval by the Engineer and Owner, prior to starting work of that phase. This work shall include megger testing of circuits and circuit segments before and after installation and connection of jumpers.

The Contractor shall install couplings and other required fittings/appurtenances in conduit systems at last pavement joint within each phase for connecting to conduit systems in the next phase, or for connecting to existing conduit systems to remain.

310-3.12 TESTING. The installation shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings as outlined in Item SS-300 and Item L-108. Testing equipment shall be furnished by the Contractor. Refer to Item L-108 for additional test requirements.

Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction.

All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

METHOD OF MEASUREMENT

310-4.1 The quantity of lights of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, base plates, gaskets, couplings, specified height columns, concrete bases, cables, connectors, safety ground rods, bolts/hardware, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare fixture requirements.

310-4.2 The quantity of guidance signs of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, concrete bases/pads, cables, connectors, safety ground rods, tethers, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare sign component requirements.

310-4.3 The quantity of field lightning arrestors, complete with arrestor, base, connectors, equipment safety ground rod, lightning arrestor ground rod, conductors, and all other required appurtenances, to be measured under this item shall be the number of each type installed, as completed units in place, ready for operation, and accepted by the Engineer.

310-4.4 Temporary airfield lighting shall be measured as a lump sum complete item per each respective phase work area, including all work completed in place and ready for operation, and including the installation, protection, and removal of all temporary cables, conduits, lighting, grounding, marking, and associated items and appurtenances, as indicated in the Drawings and as directed by the Engineer.

BASIS OF PAYMENT

310-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-310-5.1	L-858(L) Base Mounted, 2-Module Guidance Sign, Installed – per Each
Item SS-310-5.2	L-858(L) Base Mounted, 3-Module Guidance Sign, Installed – per Each
Item SS-310-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed – per Each
Item SS-310-5.4	L-852T(L) Low Profile Base Mounted In-pavement Taxiway Edge Light, Installed in Existing Pavement – per Each
Item SS-310-5.5	Field Lightning Arrestor, Installed – per Each
Item SS-310-5.6	Vehicle Sign Assembly, Installed – per Lump Sum

END OF ITEM SS-310

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ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. All reinforced concrete pipe shall be Class III pipe unless otherwise denoted on the plans. No pick-eye holes will be allowed.

701-2.2 PIPE. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 JOINT FILLERS. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets.

CONSTRUCTION METHODS

701-3.1 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical. *If subsurface conditions require, provide dewatering to carry out the work.*

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 BEDDING. The pipe bedding shall conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. Rigid Pipe. Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than *50%* ~~30%~~ of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least *50%*~~10%~~ of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be *number 57 stone as defined in ASTM C 33 or approved equal.* ~~sand or select sandy soil with 100% passing a 3/8 inch sieve and not more than 10% passing a No. 200 sieve.~~

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth	Minimum Bedding Depth
inch	inch
1/2	1
1	2
2	3
2-1/2	3-1/2

c. PVC, Polyethylene, and Polypropylene Pipe. For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 JOINING PIPE. Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal Pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, and Polypropylene Pipe. Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

701-3.5 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing *or* shall meet the requirements of Item P-153 *when called for in the Plans.* It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2 inch sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.

For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

When called for in the Plans, remove existing stormwater pipe by excavating, removing pipe, disposing of pipe in a manner consistent with local law and codes, and backfill of the excavation following Item P-152.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

701-4.2 *The length of pipe removed shall be measured in linear feet of pipe removed, backfilled, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, prior to removal, whichever is applicable.*

~~**701-4.2** The volume of concrete for pipe cradles shall be the number of cubic yards of concrete that is completed in place and accepted.~~

~~***701-4.2*** *The pipe end sections shall be measured for each complete unit installed in place, completed, and approved. Several classes, types and size shall be measured separately. All fittings and curtain walls shall be included as part of the item*~~

~~**701-4.3** The volume of rock shall be the number of cubic yards of rock excavated. No payment shall be made for the cushion material placed for the bed of the pipe.~~

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated; *and shall include all costs for excavation, dewatering, bedding, backfill and all other miscellaneous costs for installation of the pipe.* ~~at the contract unit price per cubic yard (cubic meter) of concrete for pipe cradles; and at the contract unit price per cubic yard for rock excavation.~~

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.2 *Payment will be made at the contract unit price per linear foot for removal of pipe of the type and size designated; and shall include all costs for excavation, dewatering, removal and disposal, backfill and all other miscellaneous costs for removal of the pipe.*

Payment will be made under:

Item D-701-1	18" Reinforced Concrete Pipe (Class III) – per Linear Foot

MATERIAL REQUIREMENTS

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains

ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

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ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 BRICK. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 MORTAR. Mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole.

751-2.5 CORRUGATED METAL. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

a. ASTM A48	Gray iron castings
b. ASTM A47	Malleable iron castings
c. ASTM A27	Steel castings
d. ASTM A283	Grade D: Structural steel for grates and frames
e. ASTM A536	Grade 65-45-12: Ductile iron castings
f. ASTM A897	Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 STEPS. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

751-2.8 PRECAST INLET STRUCTURES. Manufactured in accordance with and conforming to ASTM C1433.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. *If subsurface conditions require, provide dewatering to carry out the work.* The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturb and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 BRICK STRUCTURES.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and Cold Weather Protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches . When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 CORRUGATED METAL STRUCTURES. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 INSTALLATION OF STEPS. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.9 BACKFILLING.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the Engineer. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit, completed and accepted.

751-4.2 Reinforcing steel shall not be measured for separate payment but shall be considered subsidiary to the structure in which it is contained.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; *dewatering*; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-1	4'X4' Single Grate Inlet (Heavy-Duty) - per Each
Item D-751-2	4'X4' Junction Box - per Each

MATERIAL REQUIREMENTS

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

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ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

101-1.2 Limits of pavement removal, pavement repair, joint and crack repair, paint and rubber removal, and cold planing are estimated in the plans. Actual limits of these items shall be coordinated with the Engineer prior to construction.

EQUIPMENT

101-2.1 All equipment shall be specified hereinafter or as approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 REMOVAL OF EXISTING PAVEMENT

a. Concrete Pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab, or all multi-layer slabs, 1 foot inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be sawcut the full depth of the pavement. The pavement inside the sawcut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

b. Asphalt Concrete Pavement. Asphalt concrete pavement to be removed shall be cut to the full depth to existing subgrade or soil around the perimeter of the area to be removed. This includes asphalt surfacing, underlying pavement courses, and aggregate base down to top of subgrade or soil. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. If the material is to be wasted on the airport site, it shall be broken to a maximum size as designated by the airport owner.

c. Disposal. All existing pavement removed shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its costs shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.

101-3.2 PREPARATION OF JOINTS AND CRACKS. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks, ignoring hairline cracks (<

1/4 inch wide) with a crack sealant per ASTM D6690. Cracks and joints wider than 1/4 inch and less than 1/2 inch shall be filled with a hot-poured joint sealing conforming to ASTM D 6690. Wider cracks (over 1-1/2 inch wide) along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled within 0 to 1/8 inches (0-3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

a. Soil Sterilants. Soil sterilants shall contain Bromacil or Prometone and shall be approved by the Engineer. Application rates shall be in accordance with the manufacturer's recommendations.

b. Crack Preparation. A high temperature compressed air lance shall be used at all times to blast out any vegetation, dirt, dampness and loose materials from the cracks. Existing crack sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. After cleaning of crack, tack coat shall be applied prior to the application of emulsified asphalt and aggregate.

c. Filler Application. After cracks have been cleaned, received soil sterilant and tack coat, and have been approved by the Engineer, the cracks shall be filled with the emulsified asphalt and aggregate described within this specification. The mix shall be raked in the crack by hand in order to completely fill the entire crack. Once the crack is filled, excess asphalt mix shall be rounded up along the length of the crack, and pinched into the crack using a small asphalt roller. The application and compaction method shall be approved by the Engineer prior to beginning crack cleaning operations.

~~**101-3.3 REMOVAL OF PAINT AND RUBBER.** All paint and rubber over one foot wide that will affect the bond of the new overlay shall be removed from the surface of the existing pavement. Chemicals, high-pressure water, heater scarifier (asphaltic concrete only), cold milling, or sandblasting may be used. Any methods used shall not cause major damage to the pavement. Major damage is defined as changing the properties of the pavement or removing pavement over 1/8 inch deep. If chemicals are used, they shall~~

comply with the state's environmental protection regulations. No material shall be deposited on the runway shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 CONCRETE SPALL OR FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.

a. Repair of Concrete Spalls in Areas to be Overlaid with Asphalt. The Contractors shall repair all spalled concrete as shown on the plans or as directed by the Engineer. The perimeter of the repair shall be sawcut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphaltic concrete with a minimum Marshall stability of 1,200 lbs. and maximum flow of 20 (units of 0.01 in). The material shall be compacted with equipment approved by the Engineer until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphaltic Concrete Pavement Repair. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. The base course and subbase shall be replaced if it has been infiltrated with clay, silt, or other material affecting the load-bearing capacity. Materials and methods of construction shall comply with the other applicable sections of this specification.

101-3.5 COLD MILLING. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a finished surface that provides a good bond to the new overlay. The milling machine or grinder shall operate without tearing or gouging the under laying surface. The milling machine or grinder shall be equipped with automatic grade and slope controls. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material that was removed with new material at no additional cost to the Owner.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Contractor Engineer shall layout the area to be milled with a straightedge in increments of 1 foot widths. The Contractor's layout shall be approved by the Engineer prior to beginning milling operations. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, Grade Correction, or Surface Correction. The milling machine shall have a minimum width of [7] feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade and tolerances specified. The machine shall cut vertical edges. A positive method of dust control shall be provided. The machine shall have the ability to windrow the millings or cuttings**or** remove the millings or cuttings from the pavement and load them into a truck.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove any remaining aggregate or fines.

101-3.6 PREPARATION OF ASPHALT PAVEMENT SURFACES. Existing asphalt pavements indicated to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt concrete similar to that of the existing pavement in accordance with paragraph 101-3.4.

~~b. Repair joints and cracks in accordance with paragraph 101-3.2.~~

~~c. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.~~

~~d. Clean pavement surface immediately prior to placing the surface treatment by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.~~

101-3.7 MAINTENANCE. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 PREPARATION OF JOINTS IN RIGID PAVEMENT.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning Prior to Sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than three inches from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

~~**101-3.9 PREPARATION OF CRACKS IN FLEXIBLE PAVEMENT.**~~

~~**101-3.9.1 Preparation of Crack.** Widen crack with router random crack saw by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, joints will be blown out with a hot air lance combined with oil and water-free compressed air.~~

~~**101-3.9.2 Removal of Existing Sealant.** Existing sealants will be removed by routing random crack saw. Following routing sawing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.~~

METHOD OF MEASUREMENT

101-4.1 PAVEMENT REMOVAL. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor, *regardless of the thickness or composition. Asphalt milling shall be measured by the square yard milled, regardless of thickness.* Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

~~**101-4.2 JOINT AND CRACK REPAIR.** The unit of measurement for joint and crack repair shall be the linear foot of joint.~~

~~**101-4.3 PAINT AND RUBBER REMOVAL.** The unit of measurement for paint and rubber removal shall be the square foot.~~

~~**101-4.4 SPALLED AND FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.**~~

~~**a.** The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the Engineer and the Contractor.~~

~~**b.** The unit of measure for failed asphaltic concrete pavement shall be square feet.~~

~~**101-4.5 COLD MILLING.** The unit of measure for cold milling shall be [___] inches of milling per square yard. The location and average depth of the cold milling shall be determined and agreed to by the Engineer and the Contractor prior to beginning the work. If the initial cut doesn't correct the condition and surface correction is required, the Contractor shall re-mill the area and will be paid only once for the total depth of milling.~~

BASIS OF PAYMENT

101-5.1 PAYMENT. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-1	Concrete Pavement Removal - per Square Yard
Item P-101-2	Milling and Removal of Asphalt Pavement Surfacing (4" thickness) - per Square Yard

MATERIAL REQUIREMENTS

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

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ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions*. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective Grading. When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3~~. *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* ~~will~~ be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557.** The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of 2 coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed~~] [~~The quantity of compacted embankment in-place to be paid for shall be the number of cubic yards measured in its final position.~~

Measurement of excavation/embankment shall be based on ***plan quantities****. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards measured in its original position at the borrow pit.

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D 4318.

154-2.2 SAMPLING AND TESTING. Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

154-3.2 OPERATION IN PITS. The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform

and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

154-3.3 PREPARING UNDERLYING COURSE. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources will be blended and mixed, the subbase material shall be processed in a central *or*travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers of not less than 3 inches nor more than 8 inches of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory

specimens shall be compacted and tested in accordance with **ASTM D1557, determined by the Contractor in the presence of the Engineer**. The in-place field density shall be determined in accordance with **ASTM D 6938 using Procedure A, the direct transmission method, and ASTM D 6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D 6938**. The moisture content of the material at the start of compaction shall be within ±2% of the optimum moisture content. All testing shall be done by **the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.**

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8 inch when tested with a 12 feet straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

154-3.8 SURFACE TOLERANCE. The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12-foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

154-3.9 THICKNESS CONTROL. The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown. ***There will be no separate payment for additional thickness.*** The thickness of the completed subbase course shall be determined by **depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards.**

154-3.10 PROTECTION. Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

154-3.11 MAINTENANCE. The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of **square yards at the thickness indicated on the PLANS** of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon **depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard of subbase course**. On individual depth measurements, thicknesses more than 1/2 inch in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per square yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-1	8" Subbase Course - per Square Yard

TESTING REQUIREMENTS

ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-154

ITEM P-155 LIME-TREATED SUBGRADE

DESCRIPTION

155-1.1 This item shall be used for soil modification to achieve specific needs that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans. ***Dry placing of lime shall not be used. Slurry placement of lime will be the only acceptable method of placement.***

MATERIALS

155-2.1 LIME. Quicklime and hydrated lime, either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone shall not be permitted.

155-2.2 COMMERCIAL LIME SLURRY. Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

a. **Chemical Composition.** The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.

b. **Residue.** The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

   Residue retained on a No. 6 sieve = maximum 0.0%
   Residue retained on a No. 10 sieve = maximum 1.0%
   Residue retained on a No. 30 sieve = maximum 2.5%

c . **Grade.** Commercial lime slurry shall conform to one of the following two grades:

   Grade 1 – The "dry solids content" shall be at least 31% by weight, of the slurry.

   Grade 2 – The "dry solids content" shall be at least 35%, by weight, of the slurry.

d. Submittals. *The Contractor shall submit to the Engineer certified test results or manufacturer's certification on the quicklime or lime slurry mix to be used before construction. No work shall begin nor shall any lime or lime slurry be placed for payment until the Contractor has submitted samples of the materials intended for use and the materials have been approved by the Engineer.*

155-2.3 WATER. Water used for mixing or curing shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

155-2.4 SOIL. The soil for this work shall consist of inorganic natural materials on the site or selected materials from other sources; uniform in quality and gradation; and shall be approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches.

COMPOSITION

155-3.1 SOIL-LIME MIXTURE. Lime shall be applied at the rate specified on the plans for the depth of subgrade treatment shown.

155-3.2 TOLERANCES. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Lime	+ 0.5%
Water	+ 2%, -0%

WEATHER LIMITATIONS

155-4.1 WEATHER LIMITATION. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply lime unless the air temperature is at least 40°F and rising. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35°F, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.

Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 EQUIPMENT. The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the lime or lime slurry, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

CONSTRUCTION METHODS

155-6.1 GENERAL. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent courses. The Contractor shall be responsible to meet the above requirements.

Before beginning lime treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. The machine must give visible indication at all times that it is cutting the material uniformly to the proper depth over the entire width of the cut.

If a cutting and pulverizing machine is not used, the material to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. The excavated material shall then be spread to the desired cross-section and uniformly mixed and compacted.

155-6.2 APPLICATION. Lime shall be spread only over an area where the initial mixing operations can be completed during the same work day. The application and mixing of lime with the soil shall be accomplished by the methods described as "Dry Placing" or "Slurry Placing." The Contractor may use either method when hydrated lime is specified.

~~a. **Dry Placing.** The lime shall be spread uniformly over the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as specified on the plans. The material shall be sprinkled until the specified moisture content has been reached.~~

~~The lime shall be distributed in a manner that will minimize scattering by wind. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to proper application. A motor grader shall not be used to spread the lime.~~

b. Slurry Placing. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry. Commercial lime slurry shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime shall be by successive passes over a measured section of subgrade until the specified amount of lime has been spread. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as shown on the plans. The distributor truck shall continually agitate the slurry to keep the mixture uniform.

155-6.3 MIXING. The mixing procedure shall be the same for "Dry Placing" or "Slurry Placing" as hereinafter described:

a. Preliminary Mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 5% above the optimum moisture of the material and to ensure chemical action of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 48 hours or until the material becomes friable. During the curing period, the material shall be sprinkled as directed by the Engineer.

b. Final Mixing. After the required curing time, the material shall be uniformly mixed by approved methods. If the mixture contains clods, they shall be reduced in size by blading, discing, harrowing, scarifying, or the use of other approved pulverization methods so that the remainder of the clods shall meet the following requirements when tested dry by laboratory sieves. After curing, pulverize lime treated material until soil particles pass a one inch sieve and 60% pass the No. 4 sieve. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 COMPACTION. Compaction of the mixture shall immediately follow the final mixing operation with no part of the mixture uncompacted more than 30 minutes after final mixing. The material shall be aerated or sprinkled as necessary to provide the optimum moisture content during compaction. The field density of the compacted mixture shall be at least 93% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested *by the Contractor* in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in- place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. Testing frequency shall be a minimum of one compaction test per **500** square yards of stabilized base or as directed by the Engineer.

The material shall be sprinkled and rolled as directed by the Engineer. All irregularities, depressions, or weak spots that develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the subgrade shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed on it or the work is accepted by the Engineer.

The full depth of the material shown on the plans shall be compacted to remain firm and stable under construction equipment. ~~All~~ *In-place* testing shall be done by the Engineer. Perform in-place density test

to determine degree of compaction between 24 and 72 hours after final compaction and 24 hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. The shape of the course shall be maintained smooth and shall conform to the typical section shown on the plans and the established lines and grades. If the material loses the specified stability, density, and finish before the next course is placed or the work is accepted by the Engineer, the material shall be recompacted and refinished by the Contractor, and the cost shall be incidental to this item.

155-6.5 FINISHING AND CURING. After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch when tested with a 12 feet straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.

The completed section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer. Subsequent courses shall be applied within 14 days after the lime-treated subgrade is cured.

155-6.6 THICKNESS. The thickness of the final lime-treated subgrade shall be not less than the thickness specified. Thickness shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 300 square yards. When the base deficiency is more than 1/2 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace the base material where borings are taken for test purposes. This cost shall be incidental to this item.

155-6.7 MAINTENANCE. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

155-6.8 HANDLING AND SAFETY. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work.

155-7.2 Lime shall be paid by the number of tons of Hydrated Lime, or the calculated equivalent, used in the completed and accepted work. "Calculated Equivalent" will be determined by the Engineer as follows:

a. Hydrated lime delivered to the project in dry form will be measured according to the actual tonnage either spread on the subgrade or batched on site into a slurry, whichever is applicable.

b. Lime delivered to the project in slurry form will be paid for on the basis of certified chemical composition tickets and batch weight tickets. The Owner shall reserve the right to have the dry lime content verified by an independent testing laboratory. If the chemical composition is reported on the basis of Pebble Quicklime, the equivalent hydrated lime will be determined in accordance with paragraph c. below.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade at the thickness specified. The price shall be full compensation for furnishing all material, except the lime,

and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

155-8.2 Payment shall be made at the contract unit price per pound of lime. This price shall be full compensation for furnishing, delivery, and placing this material.

Payment will be made under:

Item P-155-1	16" Lime-treated subgrade - per Square Yard
Item P-155-2	Lime - per Ton

TESTING REQUIREMENTS

ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

MATERIAL REQUIREMENTS

ASTM C 51	Standard Terminology Relating to Lime and Limestone (as used by the Industry)
ASTM C 977	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
ASTM D 3551	Standard Practice for Laboratory Preparation of Soil-Lime Mixtures Using Mechanical Mixer

END OF ITEM P-155

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ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be design, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

156-1.2 *This item covers the application of Temporary Erosion Control items at locations shown on the Plans, as directed by the Engineer, and as required for permit compliance, and the* ***requirement*** *of the Contractor to produce, execute, and maintain a specific Storm Water Pollution Prevention Plan (SWPPP) for the project. The Contractor will also be required to request and obtain all necessary federal, state, and local permits. The temporary erosion control measures shown in the Plans do* ***not*** *represent the extent of work and coordination required by the Contractor under this item.*

MATERIALS

156-2.1 GRASS. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

156-2.2 MULCHES. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per ItemT-908. Mulches shall not create a wildlife attractant.

156-2.3 FERTILIZER. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 SLOPE DRAINS. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 SILT FENCE. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461

156-2.6 OTHER. All other materials shall ~~meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project~~ *be in accordance with SECTION 506 – TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS of the Standard Specifications, except as modified or augmented herein. Heavy Duty silt fencing (with welded wire in the fabric) may be required on*

steep slopes if the Engineer determines that the silt fence used by the Contractor is not performing satisfactory.

CONSTRUCTION REQUIREMENTS

156-3.1 GENERAL. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

~~The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.~~

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 INSTALLATION, MAINTENANCE AND REMOVAL OF SILT FENCES. Silt fences shall extend a minimum of 16 inches and a maximum of 34 inches above the ground surface. Posts shall be set no more than 10 feet on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch overlap and securely sealed. A trench shall be excavated approximately 4 inches deep by 4 inches wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

156-3.5 CONSTRUCTION METHODS. *Providing the temporary erosion control items and devices shown on the Plans is intended to minimize the erosion of soils during construction. However, the items and devices shown are not intended to represent all of the necessary items or procedures required to be implemented by the Contractor. The plans and specifications show the Engineer's estimate of a minimum effort needed to maintain proper erosion control during construction. Additional effort and materials may be required by the Contractor to minimize the erosion of soils during construction. It shall be the Contractor's responsibility to install and maintain all the items shown in the Plans and to coordinate, submit, obtain, and comply with all necessary Federal, State, and local permits. The coordination with governing agencies shall include, but not limited to the following:*

- *Filing the Notice of Intent with TCEQ and paying any fee(s) required with the filing,*
- *Producing and maintaining an approved Storm Water Pollution Prevention Plan,*
- *Coordinating and obtaining all local permits regarding grading operations for the proposed improvements, Contractor's staging area, spoil placement and any other grading operations related to the project as directed by the local governing agency.*
- *Filing the Notice of Termination with TCEQ and paying any fee(s) required with the filing.*

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as *one complete item. This work includes obtaining all necessary federal, state, and local permits required to complete this project.* ~~follows:~~

~~a. Temporary seeding and mulching will be measured by the square yard.~~

~~b. Temporary slope drains will be measured by the linear foot.~~

~~c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard of excavation performed, including necessary cleaning of sediment basins, and the cubic yard of embankment placed as directed by the Engineer.~~

~~d. All fertilizing will be measured by the ton.~~

~~e. Installation and removal of silt fence will be measured by the [linear foot] [Lump sum].~~

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 *Temporary erosion control acceptably completed will be paid for at the contract lump sum price bid for "TEMPORARY EROSION CONTROL," which shall be full compensation for furnishing all materials, tools, equipment, labor, and incidentals necessary to complete the work. Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer. Payment for "TEMPORARY EROSION CONTROL" will also include obtaining and compliance with the SWPPP, which shall include compensation for drainage-way inspections, report preparation, housekeeping practices, cleaning and maintenance, and other actions outlined in the SWPPP prepared by the Contractor necessary to execute the Plan. This item consists of all erosion control items not listed as a separate pay item in the Unit Price Schedule. Any fines issued to the Owner as a result of the Contractor's insufficient execution of the SWPPP will be assessed to the Contractor. Such deductions shall not be limited to the lump sum price of this item.*

Payment will be made under:

Item P-156-1	*Temporary Erosion Control—per Lump Sum*

~~**156-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:~~

~~Item P-156-5.1a~~	~~Temporary seeding and mulching – per Square Yard.~~
~~Item P-156-5.1b~~	~~Temporary slope drains – per Linear Foot.~~
~~Item P-156-5.1c~~	~~Temporary benches, dikes, dams and sediment basins – per Cubic Yard~~
~~Item P-156-5.1d~~	~~Fertilizing – per Ton~~
~~Item P-156-5.1e~~	~~Installation and removal of silt fence [per Linear Foot] [Lump Sum]~~

~~Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.~~

~~Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.~~

MATERIAL REQUIREMENTS

ASTM D6461	Standard Specification for Silt Fence Materials
AC 150/5200-33	Hazardous Wildlife Attractants

END OF ITEM P-156

ITEM P-501 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 AGGREGATES.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine Aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than 0.075mm (No. 200 sieve)	ASTM C117	3.0

Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse Aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than one inch, the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40% when tested in accordance with ASTM C 131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve (9 mm) shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (0.075mm)	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.0)	1.0
Total of all deleterious Material		3.0

Table 1. Gradation for Coarse Aggregate (ASTM C33)

Sieve Designations (square openings)		Percentage by Weight Passing Sieves	
inch	mm	#4 1-1/2 inch – 3/4 inch	#57 1 inch – No. 4
2-1/2	60	---	---
2	50	100	---
1-1/2	38	90-100	100
1	25	20-55	95-100
3/4	19	0-15	---
1/2	13	---	25-60
3/8	9	0-5	---
No. 4	4.75	---	0-10
No. 8	2.36	---	0-5

(1) Aggregate susceptibility to Disintegration (D) Cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation CF = (cumulative percent retained on the 3/8 in. sieve)(100) / (cumulative percent retained on the No. 8 sieve)

(c) The Workability Factor WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF- 28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 CEMENT. Cement shall conform to the requirements of ASTM C 150 Type I.

If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

~~**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.~~

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 JOINT SEAL. The joint seal for the joints in the concrete pavement shall meet the requirements of **Item P-605** and shall be of the type specified in the plans.

501-2.5 ISOLATION JOINT FILLER. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1752, Type II or III and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Carbon-Steel Bars conforming to the requirements of ASTM A615.

501-2.7 DOWEL AND TIE BARS. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted.

Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 WATER. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 ADMIXTURES. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:

Constituent:	Limit (Percent by Mass):
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 EPOXY-RESIN. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1 GENERAL. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 PROPORTIONS. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of **650** psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **517** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall not be more than **0.45** by weight

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a slump for sideform concrete between 1 and 2 inches (25 mm and 50 mm) as determined by ASTM C143. At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at seven (7) and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted

to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.

b. Reactivity Test Results.

c. Coarse aggregate quality test results, including deleterious materials.

d. Fine aggregate quality test results, including deleterious materials.

e. Mill certificates for cement and supplemental cementitious materials.

f. Certified test results for all admixtures, including Lithium Nitrate if applicable.

g. Specified flexural strength, slump, and air content.

h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.

k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b.Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from

laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.4 ADMIXTURES.

a. Air-Entraining admixtures. Air-entraining admixture is to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **5.5%**. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 CONCRETE MIX DESIGN LABORATORY. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

CONSTRUCTION METHODS

501-4.1 EQUIPMENT. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch Plant and Equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and Transportation Equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Nonagitator trucks. Nonagitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing Equipment. The standard method of constructing concrete pavements **may** be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float- finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 lbs per foot of paving lane width and powered by an engine having at least 6.0 horsepower per foot of lane width.

On projects requiring less than 500 square yard of cement concrete pavement or requiring individual placement areas of less than 500 square yard, or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025- 0.05 inch.

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete Saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100-foot radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting

sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 FORM SETTING. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8 inch at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 CONDITIONING OF UNDERLYING SURFACE. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3 feet to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete.

The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 CONDITIONING OF UNDERLYING SURFACE, SIDE-FORM AND FILL-IN LANE CONSTRUCTION. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 HANDLING, MEASURING, AND BATCHING MATERIAL. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 MIXING CONCRETE. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators.

Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold Weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials

b. Hot Weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature Management Program. Prior to the start of paving operation for each day of paving, the contractor shall provide the engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

501-4.8 PLACING CONCRETE. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a **flexural strength of 550 psi, based** on the average of four field cured specimens per 2,000 cubic yards of concrete placed. Also, subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi.

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-Form Construction. The concrete shall be distributed uniformly into final position by a self- propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full

width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8000 to 12000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude shall vary proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500 foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

b. Side-Form Construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines.

These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than one foot from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6 to 15 inches on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire- brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 JOINTS. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2 inch from their designated position and shall be true to line with not more than 1/4 inch variation in 10 feet. The surface across the joints shall be tested with a 12 feet straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that

spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

d. Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

e. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer.

f. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

g. Placing dowels and tie bars. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8 inch per feet. Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of ±5/8 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch. The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6 inches to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum **flexural strength of 450 psi** before drilling commences. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of ±1/2 inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of Joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 FINISHING. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straight edge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8 inch of mortar-rich surface (defined as deficient in plus U.S. No. 4 (4.75 mm) sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be

used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least one foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike- off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straight-edge Testing and Surface Correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8

inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Burlap Drag Finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard (555 grams per square meter). To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16 inch in depth.

501-4.13 CURING. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 sq ft. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to

remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

~~c. Water Method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.~~

d. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

~~**501-4.15 SAW-CUT GROOVING.** If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

501-4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with **Item P-605.**

501-4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 OPENING TO TRAFFIC. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 lb / square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 REPAIR, REMOVAL, REPLACEMENT OF SLABS.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

b. Shrinkage Cracks. Shrinkage cracks, which do not exceed 4 inches in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4 inches in depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs With Cracks through Interior Areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches in depth, that extend into the interior area.

d. Cracks Close To and Parallel To Joints. All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6 inches either side of the joint shall be treated as specified here. Any crack extending more than 6 inches from the joint shall be treated as specified above in subparagraph c.

(1) Full Depth Cracks Present, Original Joint Not Opened. When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure

injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full Depth Cracks Present, Original Joint Also Cracked. At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.

e. Removal and Replacement of Full Slabs. Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars. These joints shall then be carefully sawed on the joint line to within one inch of the depth of the dowel or tie bar.

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment.

Care shall be taken to prevent damage to the dowels, tie bars, or to concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

f. Repairing Spalls Along Joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inch. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high-pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat of epoxy resin, Type III, Grade I, shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Pooling of epoxy resin shall be avoided. The cavity shall be filled with low slump Portland cement

concrete or mortar or with epoxy resin concrete or mortar. Concrete shall be used for larger spalls, generally those more than 1/2 cu. ft. in size, and mortar shall be used for the smaller ones. Any spall less than 0.1 cu. ft. shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Portland cement concrete and mortar mixtures shall be proportioned as directed and shall be mixed, placed, consolidated, and cured as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140°F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper one-eight (1/8th) inch of the pavement surface.

g. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch wide and there shall be a minimum of 55 to 60 blades per 12 inches of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The area corrected by diamond grinding the surface of the hardened concrete should not exceed 10% of the total area of any sublot. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, may require removing and replacing in conformance with paragraph 501-4.19.

501-4.20 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR.

All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface.

a. Removal of Existing Pavement Slab.

When it is necessary to remove existing concrete pavement and leave adjacent concrete in place, unless there are dowels present, the joint between the removal area and adjoining pavement to stay in place, including dowels or tie bars, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made full depth just beyond the end of dowels. The edge shall then be carefully sawed on the joint line to within one inch of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 12 inches from the end of any dowels. All pavement between this last saw cut and the joint line shall be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or the approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in

the pavement which is to remain in place. Where dowels are present, care shall be taken to produce an even, vertical joint face below the dowels. If the Contractor is unable to produce such a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501- 4.10g. All this shall be at no additional cost to the Owner.

Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any direction greater than 1/2 inches and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

b. Edge repair.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas that are damaged during construction shall be repaired at no cost to the Owner.

(1) Spall repair. Spalls shall be repaired where indicated and where directed by the Engineer. Repair materials and procedures shall be as previously specified in subparagraph 501-4.19f.

(2) Underbreak repair. All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompacted, without addition of any new material. Finally, the void shall be completely filled with paving concrete, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound.

(3) Underlying material. The underlying material adjacent to the edge and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient material shall be kept in place outside the joint line to prevent disturbance (or sloughing) of material under the pavement that is to remain in place. Any material under the portion of the concrete pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified in paragraph 501-4.20b(2). The underlying material outside the joint line shall be thoroughly compacted and moist when new concrete is placed.

MATERIAL ACCEPTANCE

501-5.1 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the Engineer at no cost to the Contractor. The Contractor shall bear the cost of providing curing facilities for the strength specimens, per paragraph 501-5.1a(3), and coring and filling operations, per paragraph 501-5.1b(1). Testing organizations performing these tests shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Concrete shall be accepted for strength and thickness on a lot basis

A lot shall consist of a day's production not to exceed **2,500 square yards.**

a. Flexural Strength.

(1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete shall be sampled in accordance with ASTM C172.

(2) Testing. Two (2) specimens shall be made from each sample. Specimens shall be made in accordance with ASTM C31 and the flexural strength of each specimen shall be determined in accordance with ASTM C78. The flexural strength for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

Immediately prior to testing for flexural strength, the beam shall be weighed and measured for determination of a sample unit weight. Measurements shall be made for each dimension; height, depth, and length, at the mid-point of the specimen and reported to the nearest 1/10 inch. The weight of the specimen shall be reported to the nearest 0.1 pound. The sample unit weight shall be calculated by dividing the sample weight by the calculated volume of the sample. This information shall be reported as companion information to the measured flexural strength for each specimen.

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method.

Slump, air content, and temperature tests will also be conducted by the quality assurance laboratory for each set of strength test samples, per ASTM C31.

(3) Curing. The Contractor shall provide adequate facilities for the initial curing of beams. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

(4) Acceptance. Acceptance of pavement for flexural strength will be determined by the Engineer in accordance with paragraph 501-5.2b.

b. Pavement Thickness.

(1) Sampling. Each lot shall be divided into four equal sublots and one core shall be taken by the Contractor for each sublot. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, shall be excluded from sample locations.

Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes shall be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores shall be determined by the Engineer by the average caliper measurement in accordance with ASTM C174.

(3) Acceptance. Acceptance of pavement for thickness shall be determined by the Engineer in accordance with paragraph 501-5.2c.

c. Partial Lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they shall constitute a lot. Where one or two sublots have been produced, they shall be incorporated into the next lot or the previous lot and the total number of sublots shall be used in the acceptance criteria calculation, that is, n=5 or n=6.

d. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the percentage of material within specification limits (PWL) shall be determined using the remaining test values.

501-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-5.2e:

(1) Flexural strength
(2) Thickness
(3) Smoothness
(4) Grade
(5) Edge slump

Flexural strength and thickness shall be evaluated for acceptance on a lot basis using the method of estimating PWL. Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L).

Acceptance for flexural strength will be based on the criteria contained in accordance with paragraph 501-5.2e(1). Acceptance for thickness will be based on the criteria contained in paragraph 501-5.2e(2). Acceptance for smoothness will be based on the criteria contained in paragraph 501-5.2e(3). Acceptance for grade will be based on the criteria contained in paragraph 501-5.2e(4).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Flexural Strength. Acceptance of each lot of in-place pavement for flexural strength shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

c. Pavement Thickness. Acceptance of each lot of in-place pavement shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

d. Percentage of Material Within Limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The lower specification tolerance limit (L) for flexural strength and thickness shall be:

Lower Specification Tolerance Limit (L)

Flexural Strength	0.93 x strength specified in paragraph 501-3.1
Thickness	Lot Plan Thickness in inches, - 0.50 in

e. Acceptance Criteria.

(1) Flexural Strength. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(3) Smoothness. As soon as the concrete has hardened sufficiently, but not later than 48 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each section of pavement having an average profile index meeting the requirements of paragraph 501-8.1c when evaluated with a profilograph; and the finished surface of the pavement shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. When the surface smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the pavement, full depth removal and replacement of pavement shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet or more often if directed by the Engineer. Maximum gap on final pavement surface > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the one third points of paving lanes when widths of paving lanes are 20 ft or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. Smoothness readings will not be made across grade changes or cross slope transitions, at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement surface > 1/4 inch in longitudinal direction will be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

~~**(ii) Profilograph Testing.** Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.~~

~~The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. Deviations on final surface in longitudinal direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.~~

~~Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches per mile or less. If the initial average profile index was less than 15 inches, only those areas representing greater than 0.4 inch deviation will be re-profiled for correction verification.~~

~~**(iii) Final profilograph of runway.** Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.~~

~~Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 48 hours of placement of material. Smoothness texting indicated in paragraph (iii) shall be performed within 48 hours final paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then~~

~~production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.~~

(4) Grade. An evaluation of the surface grade shall be made by the Engineer for compliance to the tolerances contained below. The finish grade will be determined by running levels at intervals of 50 ft or less longitudinally and all breaks in grade transversely (not to exceed 50 ft) to determine the elevation of the completed pavement. The Contractor shall pay the costs of surveying the level runs, and this work shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

(a) Lateral Deviation. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.

(b) Vertical Deviation. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.

(5) Edge Slump. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer in accordance with paragraph 501-4.8a.

f. Removal and Replacement of Concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 501-4.10 shall apply to all contraction joints exposed by concrete removal. Removal and replacement shall be in accordance with paragraph 501-4.20.

CONTRACTOR QUALITY CONTROL

501-6.1 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that effect the quality of the pavement including but not limited to:

a. Mix Design
b. Aggregate Gradation
c. Quality of Materials
d. Stockpile Management
e. Proportioning
f. Mixing and Transportation
g. Placing and Consolidation
h. Joints
i. Dowel Placement and Alignment
j. Flexural or Compressive Strength
k. Finishing and Curing
l. Surface Smoothness

501-6.2 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

a. Fine Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 70 or ASTM C 566.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 566.

c. Slump. Four slump tests shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air Content. Four air content tests, shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Four unit weight and yield tests shall be made in accordance with ASTM C 138. The samples shall be taken in accordance with ASTM C 172 and at the same time as the air content tests.

501-6.3 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, moisture content and air content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and Coarse Aggregate Gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in the Lower Specification Tolerance Limit (L) table above and the Control Chart Limits table below shall be superimposed on the Control Chart for job control.

b. Slump and Air Content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

CONTROL CHART LIMITS			
Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1 inch	+0.5 to -1.5 inch	± 1.5 inch
Air Content	±1.2%	± 1.8%	± 2.5%
Fixed Form			
Slump	+ 0.5 to -1 inch	+1 to -1.5 inch	± 1.5 inch
Air Content	± 1.2%	± 1.8%	± 2.5%

The individual measurement control charts shall use the mix design target values as indicators of central tendency.

501-6.4 CORRECTIVE ACTION. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of control. The Contractor Quality Control Program shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and Coarse Aggregate Gradation. When two consecutive averages of five tests are outside of the specification limits in paragraph 501-2.1, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Fine and Coarse Aggregate Moisture Content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

c. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

d. Air Content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

METHOD OF MEASUREMENT

501-7.1 Portland cement concrete pavement shall be measured by the number of **square yards** of either plain or reinforced pavement as specified in-place, completed and accepted.

The Contractor's Quality Control Plan shall not be measured separately but shall be considered an incidental aspect of the pavement construction.

BASIS OF PAYMENT

501-8.1 PAYMENT. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-5.2 Acceptance Criteria shall be based on results of smoothness, strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness and 501-8.1c for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed **100 percent** of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both flexural strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both flexural strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either flexural strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both flexural strength and thickness are less than 100%.

PRICE ADJUSTMENT SCHEDULE [1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment limitation shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%.

b. Payment. Payment shall be made under:

Item P-501-1 12.5" Portland Cement Concrete Pavement—per square yard

c. Basis of adjusted payment for Smoothness. Price adjustment for pavement smoothness will apply to the total area of concrete within a section of pavement and shall be applied in accordance the following equation and schedule:

(Square yard in section) × (original unit price per square yard) × PFm = reduction in payment for area within section

Average Profile Index (Inches Per Mile) Pavement Strength Rating			Contract Unit Price Adjustment (PFm)
Over 30,000 lb	30,000 lb or Less	Short Sections	
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	0.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 and up	15.1 and up	22.1 and up	Corrective work required

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing With Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662 Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A714	Standard Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving And Structural Construction
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
AC 150/5320-6	Airport Pavement Design and Evaluation
PCA	Design and Control of Concrete Mixtures

END ITEM P-501

ITEM P-605 JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

This item shall also consist of the cleaning and sealing of cracks and joints in existing concrete pavement, at the locations shown in the plans or as directed by the Engineer. The amount of crack filling/sealing designated in the Plans is estimated.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealant materials shall meet the requirements of **ASTM D 5893, Type SL Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.**

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 BACKER ROD. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the ~~crack~~ joint.

605-2.3 BACKUP MATERIALS. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.4 BOND BREAKING TAPES. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.5 HERBICIDES. *Submit documentation on all herbicides to be used in the preparation of the joint replacement. Include in submittal proposed application rates in accordance with Texas Department of Agriculture regulations.*

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

Prior to beginning the sealing operation, the Contractor shall have the sealant supplier demonstrate, to the satisfaction of the Engineer, the cleaning and installation procedures for the joint sealant to be installed on the project.

If the pavement must be opened to traffic prior to placement of the sealant, Contractor to temporarily fill the joint with a jute or nylon rope immediately after the joint is sawed and or opened. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch below the pavement surface. The rope shall be removed immediately prior to cleaning and or sealing.

605-3.2 EQUIPMENT. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **15** days prior to use on the project.

605-3.3 PREPARATION OF JOINTS *IN NEW PAVEMENT*.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint faces shall be surface dry when the seal is applied.

Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Back-Up Material. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-Breaking Tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 INSTALLATION OF SEALANTS *IN NEW PAVEMENT*. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install

the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 PREPARATION OF JOINTS/CRACKS IN EXISTING PAVEMENT

a. Cleaning and Sealing of Cracks. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from the cracks shall be accomplished by routing. Cracks shall be routed so that the exposed face of the crack is enlarged to a width of 1/2" and to a depth as detailed in the sealant manufacturer's recommendations. Other methods of crack cleaning and preparation may be used with the approval of the Engineer.*

b. Cleaning and Sealing of Joints. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from existing joints shall be accomplished via the use of a high temperature compressed air lance. Existing joint sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. Other methods of joint cleaning and preparation may be used ONLY with the approval of the Engineer.*

If vegetation is a problem a soil sterilant shall be applied. Soil sterilants shall contain Bromacil (or equal) or Diuron (or equal) and shall be approved by the Engineer. Application rates shall be maximum recommended by the manufacturer.

When the cracks/joints are thoroughly dry, and just prior to sealant placement, both vertical faces shall be cleaned by sandblasting with a nozzle attached to an aiming device that directs the sand blast at approximately a 45 degree angle and a maximum of two inches from the face of the crack/joint. Each crack/joint face shall be sandblasted individually. After sandblasting, compressed air shall be used to blow out the crack/joint and remove all residual dust. Air compressors shall be equipped with suitable traps capable of removing all free water and oil from the compressed air and shall be capable of furnishing air with a pressure greater than 90 psi. The cracks/joints shall be thoroughly dry before the sealant is placed.

All cracks/joints shall be sealed the same day of the final sandblasting. Cleaned cracks/joints left open overnight or cracks/joints which become contaminated before sealing shall be re-cleaned as specified above.

605-3.6 INSPECTION. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.7 CLEAN-UP. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 *For joint sealing in newly constructed pavements, there will be no measurement for payment under this item. For joint cleaning and re-sealing in existing concrete pavement,* Joint sealing ~~material~~ shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 *For joint sealing in newly constructed pavements, there will be no separate payment under this item. Include costs associated in this item as subsidiary to other items.*

605-5.2 *For joint cleaning and re-sealing in existing concrete pavement,* Payment for joint sealing material shall be made at the contract unit price per **linear foot**. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-1	Concrete Joint Clean and Seal - per Linear Foot

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

END OF ITEM P-605

ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of reinforced structural Portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

Gradation For Coarse Aggregate

Percentage by Weight Passing Sieves	Sieve Designation (square openings)
	No. 4 to 1 in. (4.75-25 mm)
2" (50 mm)	**---**
1-1/2" (38 mm)	**100**
1" (25 mm)	**90-100**
3/4" (19 mm)	**---**
1/2" (12 mm)	**25-60**
3/8" (9 mm)	**---**
No. 4	**0-10**

610-2.2.1 AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING. Aggregates that have a history of D-cracking shall not be used.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 CEMENT. Cement shall conform to the requirements of **ASTM C 150** Type **I or II.**

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

610-2.6 ADMIXTURES AND SUPPLEMENTARY CEMENTITIOUS MATERIAL. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-Entraining Admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

~~**c. Other chemical admixtures**. The use of set retarding, and set- accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set- accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.~~

~~**d. Lithium nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:~~

~~Constituent~~	~~Limit (Percent by Mass)~~
~~LiNO3 (Lithium Nitrate)~~	~~30 ±0.5~~
~~SO4 (Sulfate Ion)~~	~~0.1 (max)~~
~~Cl (Chloride Ion)~~	~~0.2 (max)~~
~~Na (Sodium Ion)~~	~~0.1 (max)~~
~~K (Potassium Ion)~~	~~0.1 (max)~~

~~Provide a trained representative to supervise the lithium nitrate admixture dispensing and mixing operations.~~

e. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of ASTM **D 1752.**

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of **Reinforcing Steel** conforming to the requirements of **ASTM A615.**

610-2.10 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to **one of the following**.

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of **3,000 psi** in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, ±1%, as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 QUALIFICATIONS FOR CONCRETE TESTING SERVICE. Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

610-3.5 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

610-3.6 CONSISTENCY. The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

610-3.7 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

610-3.8 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.9 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

610-3.10 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.11 EMBEDDED ITEMS. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.12 PLACING CONCRETE. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been ~~approved~~ *reviewed by the Engineer*. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.13 VIBRATION. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a

compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

610-3.14 CONSTRUCTION JOINTS. If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.15 EXPANSION JOINTS. Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

610-3.16 DEFECTIVE WORK. Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

610-3.17 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

610-3.18 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

610-3.19 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.20 COLD WEATHER PLACING. When concrete is placed at temperatures below 40°F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F.

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds of Type 1 nor more than 1.6 pounds of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas,

framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F until at least 60% of the designed strength has been attained.

610-3.21 HOT WEATHER PLACING. Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed 90°F when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

610-3.22 FILLING JOINTS. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete shall be ~~measured by the number of cubic yards of concrete complete in place and accepted. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer.~~ *not be measured for separate payment unless otherwise noted.* No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions in yardage shall be made for the volumes of reinforcing steel or embedded items.

610-4.2 Reinforcing steel shall be *not be measured for separate payment.* ~~measured by the calculated theoretical number of pounds placed, as shown on the plans, complete in place and accepted. The unit weight used for deformed bars shall be the weight of plain square or round bars of equal nominal size. If so indicated on the plans, the poundage to be paid for shall include the weight of metal pipes and drains, metal conduits and ducts, or similar materials indicated and included.~~

BASIS OF PAYMENT

610-5.1 Payment shall *not be paid for separately but shall be considered subsidiary to the item in which it is contained, unless otherwise noted.* ~~be made at the contract unit price per cubic yard for structural Portland cement concrete and per pound for reinforcing steel. These prices shall be full compensation for furnishing all materials and for all preparation, delivery and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

~~Payment will be made under:~~

~~Item P-610-5.1~~	~~Structural Portland Cement Concrete – per Cubic Yard~~
~~Item P-610-5.2~~	~~Steel Reinforcement – per Pound~~

TESTING REQUIREMENTS

ASTM C 31	Making and Curing Test Specimens in the Field

ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 666	Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar- Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A 184	Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 704	Welded Steel Plain Bars or Rod Mats for Concrete Reinforcement
ASTM C 33	Concrete Aggregates
ASTM C 94	Ready-Mixed Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheet Materials for Curing Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 595	Blended Hydraulic Cements
ASTM C 618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T 26	Quality of Water to be Used in Concrete
ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 MARKING MATERIALS. Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2. Paint shall be furnished in **White (37925), Red (31136), Yellow (33538 or 33655), or Black (37038)** in accordance with Federal Standard No. 595.

a. WATERBORNE. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type I. The non- volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

~~**b. EPOXY.** Paint shall be a two component, minimum 99% solids type system conforming to the following:~~

~~**(1) Pigments.** Component A. Percent by weight.~~

~~**(a) White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 18% minimum (16.5% minimum at 100% purity).~~

~~**(b) Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 14 to 17%.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~Epoxy resin shall be 75 to 79%.~~

~~**(2) Epoxy Content.** Component A. The weight per epoxy equivalent, when tested in accordance with ASTM D1652 shall be the manufacturer's target ±50.~~

~~**(3) Amine Number.** Component B. When tested in accordance with ASTM D2074 shall be the manufacturer's target ±50.~~

~~**(4) Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~(5) Daylight Directional Reflectance:~~

~~(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.~~

~~(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:~~

~~x .462~~	~~x .470~~	~~x .479~~	~~x .501~~
~~y .438~~	~~y .455~~	~~y .428~~	~~y .452~~

~~(6) Accelerated Weathering.~~

~~(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 × 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.~~

~~(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.~~

~~(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2b(5) above. Evaluate for conformance with the color requirements.~~

~~(7) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.~~

~~(8) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.~~

~~(9) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.~~

~~(10) Hardness, Shore. Hardness shall be at least 80 when tested in accordance with ASTM D2240.~~]

~~c. METHACRYLATE. Paint shall be a two component, minimum 99% solids type system conforming to the following:~~

~~(1) Pigments. Component A. Percent by weight.~~

~~(a) White:~~
~~Titanium Dioxide, ASTM D476, type II shall be 8% minimum. Methacrylate resin shall be 18% minimum.~~

~~(b) Yellow and Colors:~~

~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

Organic yellow, other colors, and tinting as required to meet color standard.

Methacrylate resin shall be 18% minimum.

(2) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(3) Daylight Directional Reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

	x .462	x .470	x .479	x .501
	y .438	y .455	y .428	y .452

(4) Accelerated Weathering.

(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2c(3) above. Evaluate for conformance with the color requirements.

(5) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.

(7) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.

(8) Hardness, Shore. Hardness shall be at least 60 when tested in accordance with ASTM D2240.

d. SOLVENT-BASE. Paint shall meet the requirements of Commercial Item Description A-A-2886B Type I, Type II, and Type III.

~~e. **PREFORMED THERMOPLASTIC AIRPORT PAVEMENT MARKINGS.** Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.~~

~~(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.~~

~~(a) The markings must be supplied with an integral, non-reflectorized black border.~~

~~(2) **Graded Glass Beads.**~~

~~(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type IV.~~

~~(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (±10%) per 10 square feet. These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.~~

Size Gradation		Retained, %	Passing, %
US Mesh	µm		
12	1700	0 – 2	98 – 100
14	1400	0 – 3.5	96.5 – 100
16	1180	2 – 25	75 – 98
18	1000	28 – 63	37 – 72
20	850	63 – 72	28 – 37
30	600	67 – 77	23 – 33
50	300	89 – 95	5 – 11
80	200	97 – 100	0 – 3

~~(3) **Heating Indicators.** The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.~~

~~(4) **Pigments.** Percent by weight.~~

~~(a) **White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 10% minimum.~~

~~(b) **Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~(5) **Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~(6) **Daylight Directional Reflectance.**~~

~~(a) **White:**~~

The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(7) Skid Resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil.

(9) Environmental Resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed Thermoplastic Airport Pavement Marking Requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross- sectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be re-opened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements for **Federal Specification TT-B-1325D, Type I, Gradation A**. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. **Painting operations shall be discontinued when the surface temperature exceeds 120°F.** Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by **waterblasting** or by other methods as required to remove all contaminants while minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. *Grinding of the pavement will not be permitted.* After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are cleaned of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

At least 24 hours prior to remarking existing markings, the existing markings must be ~~**removed**~~ *prepared* **such that** ~~**75% existing markings are removed**~~ *any loose or contaminated material that will affect the bond of the new paint are removed.* **After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air or both.** *The preparation is NOT to damage the pavement around and beneath the paint being prepared for remarking. Any damage is to be corrected immediately at no additional cost to the Owner.*

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by

the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of **30 days** shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 TEST STRIP. Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS
~~(See Note Regarding Red and Pink Paint)~~

Paint Type	Paint Square feet per gallon, ft^2/gal	Glass Beads, Type I, Gradation A Pounds per gallon of paint—lb./gal.	Glass Beads, Type III Pounds per gallon of paint—lb./gal.	Glass Beads, Type IV Pounds per gallon of paint—lb./gal.
Waterborne Type I	**115 ft^2/gal max**	**7 lb/gal min (0.85 kg/l)**	--	--

When pavement markings are required on a newly placed pavement, the pavement markings shall be completed in two applications. The first application shall be 33% of the application rate specified in Table 1. The second application shall be 100% of the application rate specified in Table 1, placed in the opposite direction of the first pass. Glass beads shall only be included in the second application of the pavement markings.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 APPLICATION – PREFORMED AIRPORT PAVEMENT MARKINGS.

a. Asphalt and Portland Cement To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet and a free span between supporting wheels of no less than 18 feet. The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.

620-3.8 PROTECTION AND CLEANUP. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

620-3.9 REMOVAL OF EXISTING MARKINGS. *The existing pavement markings shown on the plans to be removed shall be removed without damaging the existing pavement. The markings shall be removed through the use of high-pressure water or other methods approved by the Engineer before removal operations begin. For areas to be repainted, the existing painted surface shall be cleaned by high-pressure water blasting or sand blasting, as required, to remove all foreign material which would reduce the bond between the new paint and the old paint.*

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be **the number of square feet of painting including reflective media when required** ~~**and the number of pounds of reflective media**~~ performed in accordance with the specifications and accepted by the Engineer. *Where multiple pavement marking applications are specified, there will be no separate payment for temporary pavement markings (first pass). If either the temporary or final application of pavement markings are not required, the contract quantity shall be adjusted according to the markings actually completed.*

The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting including reflective media when required, performed in accordance with the specifications and accepted by the Engineer.

620-5.2 *Payment shall be made at a lump sum price for paint marking removal. The price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.*

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract **price per square foot** for runway and taxiway painting and for reflective media *and lump sum for pavement marking removal. For paint markings*

placed on existing pavement markings, there is no separate pay for pavement marking preparation as described in this item and is to be considered inclusive of the pavement markings pay item. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1	Retro-Reflective Pavement Markings - per square foot
Item P-620-2	Non-Reflective Black Outline - per square foot
Item P-620-3	Pavement Marking Removal - per lump sum

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D
Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247 Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E
Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B

Paint, Traffic, Solvent Based

FED STD 595 Colors used in Government Procurement

AC 150/5340-1 Standards for Airport Markings

END OF ITEM P-620

ITEM P-631 REFINED COAL TAR EMULSION WITH ADDITIVES, SLURRY SEAL SURFACE TREATMENT

DESCRIPTION

631-1.1 This item shall consist of a mixture of emulsified asphalt, mineral aggregate, and water properly proportioned, mixed, and spread on an asphalt pavement surface, including airport pavements serving airplanes 12,500 lbs or less, roads, and other general applications. The purpose of this refined coal tar emulsion product is to provide a fuel-resistant surface where pavements are subjected to fuel spills. The application of the surface treatment shall be in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer.

631-1.2 GENERAL. This item shall consist of a mixture of refined coal tar emulsion, mineral aggregate, additives, and water properly proportioned, mixed and applied as a slurry seal on new or existing (aged) asphalt concrete pavement.

MATERIALS

631-2.1 REFINED COAL TAR EMULSION. A refined coal tar emulsion prepared from a high temperature refined coal tar conforming to the requirements of ASTM D490 for grade 11-12. The use of oil and water gas tar is not allowed. Base refined coal tar emulsion must conform to all requirements of ASTM D5727.

a. Health, safety, and environment. The Contractor must provide a complete Material Safety Data Sheet (MSDS) in accordance with U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations (Standards – 29 CFR, 1910.1200) which establishes the requirement and minimum information for the MSDS for hazardous materials. The MSDS, Section II, shall include the Chemical Abstracts Service (CAS) registry numbers for all applicable hazardous ingredients in the coal tar emulsion product. The Contractor must provide the manufacturer's certification that the product complies with the Code of Federal Regulation (CFR) Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products (for the airport location) and Water Programs, Part 116, Designation of Hazardous Substances.

631-2.2 AGGREGATE. The aggregate shall be washed dry silica sand or boiler slag free of dust, trash, clay, organic materials or other deleterious substances. The aggregate shall meet the gradation in Table 1, when tested in accordance with ASTM C136.

Table 1. Gradation Of Aggregates*

Sieve Size		Percent Retained	
		Minimum	Maximum
#20 or coarser	(0.850 mm)	0	2
#30	(0.600 mm)	0	12
#40	(0.425 mm)	2	60
#50	(0.300 mm)	5	60
#70	(0.212 mm)	5	60
#100	(0.150 mm)	5	30
#140	(0.106 mm)	0	10
#200	(0.075 mm)	0	2
Finer than #200		0	0.3

* Table 1 represents the maximum range of aggregate gradations. In all cases the refined coal tar emulsion supplier is to give written approval of the aggregate used in the mix design.

631-2.3 ADDITIVE. As specified by the coal tar emulsion manufacturer.

631-2.4 WATER. Water for mixing shall be potable, free of harmful soluble salts, and at least 50°F.

631-2.5 CRACK SEALANT. Crack sealant shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.6 OIL SPOT PRIMER. Oil spot primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.7 PAVEMENT PRIMER. Pavement primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

COMPOSITION AND APPLICATION

631-3.1 COMPOSITION. The refined coal tar emulsion seal coat is to consist of a mixture of refined coal tar emulsion, water, additive and aggregate, and be proportioned as shown in Table 2. The composition must have written approval of the coal tar emulsion manufacturer.

631-3.2 QUANTITIES OF MATERIALS PER SQUARE YARD. The Contractor shall submit the recommended formulation of water, emulsion, aggregate and application rate proposed for use to a testing laboratory together with sufficient materials to verify the formulation at least **5** days prior to the start of operations. The mix design shall be within the range shown in the below table. No seal coat shall be produced for payment until a mix has been approved by the Engineer. The formulation shall pass the fuel resistance test in Addendum A.

The mix for each mixture shall be in effect until modified in writing by the Engineer.

Table 2. Composition Of Mixture Per 100 Gallons Of Refined Coal Tar Emulsion

Application	Refined Coal Tar Emulsion Gallons	Water Gallons	Additive Gallons	Aggregate Pounds	Formula Rate of Application of Mix per Square Yard	
					Minimum Gallons	Maximum Gallons
Prime Coat (where required) as specified by the coal tar emulsion manufacturer						
1st Seal Coat	100	25-70	2-6	300-700	0.12	0.20
2nd Seal Coat	100	25-70	2-6	300-700	0.12	0.20

631-3.3 APPLICATION RATE. Application rates are not to exceed 0.20 gal/yd^2/coat and at no time are total coats to exceed 0.51 gal/yd^2

631-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of mixture in the proportions shown in the approved mix design. The amount of mixture shall be sufficient to place a test section a minimum of 250 square yard at the rate specified in the job mix formula. The test area will be designated by the Engineer on a representative section of the pavement to be seal coated. The actual application rate will be determined by the Engineer during placement of the test section and will depend on the condition of the pavement surface.

The test section shall be used to verify the adequacy of the mix design and to determine the application rate. The same equipment and method of operations shall be used on the test section that will be used on the remainder of the work.

If the test section should prove to be unsatisfactory, the necessary adjustments to the job mix formula, mix composition, application rate, placement operations, and equipment shall be made. Additional test sections shall be placed and evaluated, if required. Full production shall not begin without the Engineer's approval. Acceptable test sections shall be paid for in accordance with paragraph 631-7.1.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying test areas and/or test sections to determine the optimum application rate of both emulsion and sand.

CONSTRUCTION METHODS

631-4.1 WEATHER LIMITATIONS. The seal coat shall not be applied when the surface is wet or when the humidity or impending weather conditions will not allow proper curing. The seal coat shall be applied only when the atmospheric or pavement temperature is 50°F and rising and is expected to remain above 50°F for 24 hours, unless otherwise directed by the Engineer.

631-4.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Distributors. Distributors or spray units used for the spray application of the seal coat shall be self-propelled and capable of uniformly applying 0.12 to 0.55 gallons per square yard of material over the required width of application. Distributors shall be equipped with removable manhole covers, tachometers, pressure gauges, and volume-measuring devices.

The mix tank shall have a mechanically powered, full-sweep, mixer with sufficient power to move and homogeneously mix the entire contents of the tank.

The distributor shall be equipped with a positive placement pump so that a constant pressure can be maintained on the mixture to the spray nozzles.

b. Mixing equipment. The mixing machine shall have a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, and emulsion, and of discharging the thoroughly mixed product on a continuous basis. The mixing unit shall be capable of thoroughly blending all ingredients together and discharging the material to the spreader box without segregation.

c. Spreading equipment. Spreading equipment shall be a mechanical-type squeegee distributor attached to the mixing machine, equipped with flexible material in contact with the surface to prevent loss of slurry from the spreader box. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; coal tar emulsion and aggregate build-up on the box shall not be permitted.

d. Hand squeegee or brush application. The use of hand spreading application shall be restricted to places not accessible to the mechanized equipment or to accommodate neat trim work at curbs, etc. Material that is applied by hand shall meet the same standards as that applied by machine.

e. Calibration. The Contractor shall furnish all equipment, materials and labor necessary to calibrate the equipment. It shall be calibrated to assure that it will produce and apply a mix that conforms to the job mix formula. Commercial equipment should be provided with a method of calibration by the manufacturer. All calibrations shall be made with the approved job materials prior to applying the seal coat to the pavement. A copy of the calibration test results shall be furnished to the Engineer.

631-4.3 PREPARATION OF ASPHALT PAVEMENT SURFACES. Clean pavement surface immediately prior to placing the seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface

film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with paragraph 101-3.6.

631-4.4 MIXING. Blend the coal tar emulsion mixture in the equipment described in paragraph 631-4.2 using the ingredients described in Table 2. The mixing must produce a smooth homogeneous mixture of uniform consistency. (Consult coal tar emulsion supplier for its recommended order of addition of the ingredients.) During the entire mixing and application process, no breaking, segregating or hardening of the emulsion, nor balling or lumping of the sand is to be permitted. Continue to agitate the seal coating mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application.

Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the specified amount.

631-4.5 APPLICATION OF SLURRY SEAL SURFACE TREATMENT. The aggregate filled slurry seal surface treatment shall be applied at a uniform rate determined in paragraph 631-3.3.

In order to provide maximum adhesion, the pavement shall be dampened with a fog spray of water if recommended by the supplier. No standing water shall remain on the surface.

If a prime coat is required, mix and apply the prime coat as specified in paragraph 631-4.3.

Apply the first coat uniformly to obtain the rate determined in paragraph 631-3.3.

Each coat shall be allowed to dry and cure initially before applying any subsequent coats. The initial drying shall allow evaporation of water of the applied mixture, resulting in the coating being able to sustain light foot traffic. The initial curing shall enable the mixture to withstand vehicle traffic without damage to the seal coat.

Apply the second coat in the same manner as outlined for the first coat.

Additional coats shall be applied over the entire surface as directed by the Engineer.

The finished surface shall present a uniform texture.

The final coat shall be allowed to dry a minimum of eight hours in dry daylight conditions before opening to traffic, and initially cure enough to support vehicular traffic without damage to the seal coat.

Where marginal weather conditions exist during the eight hour drying time, additional drying time shall be required. The length of time shall be as specified by the supplier. The surface shall be checked after the additional drying time for trafficability before opening the section to vehicle traffic.

Where striping is required, the striping paint used shall meet the requirements of P-620, shall be compatible with the seal coat and as recommended by the coal tar emulsion manufacturer.

QUALITY CONTROL

631-5.1 CONTRACTOR'S CERTIFICATION. The Contractor shall furnish the manufacturer's certification that each consignment of emulsion shipped to the project meets the requirements of ASTM D5727, except that the water content shall not exceed 50%. The certification shall also indicate the solids and ash content of the emulsion and the date the tests were conducted. The certification shall be delivered to the Engineer prior to the beginning of work. The manufacturer's certification for the emulsion shall not be interpreted as

a basis for final acceptance. Any certification received shall be subject to verification by testing samples received for project use.

The Contractor shall also furnish a certification demonstrating a minimum of three years of experience in the application of coal tar emulsion seal coats.

631-5.2 INSPECTION. The Contractor shall have an independent technical consultant on the job site at the beginning of operations for application of coal tar emulsion seal coats. The consultant shall have knowledge of the materials, procedures, and equipment described in this specification and shall assist the Contractor regarding proper mixing of the component materials and application of the seal coat. The consultant shall have a minimum of three (3) years of experience in the use of coal tar seal coats.

Documentation of this experience shall be furnished to the Engineer prior to the start of operations. The cost of the technical consultant shall be paid for by the Contractor.

631-5.3 SAMPLING. A minimum of one sample per day shall be tested for the properties of Table 2. A random sample of approximately one-quart of the composite mix will be obtained daily by the Contractor and stored in a glass container. The containers shall be sealed against contamination and retained in storage by the Owner for a period of six months. Samples shall be stored at room temperature and not be subjected to freezing temperatures.

A sample of undiluted coal tar emulsion shall be obtained from each consignment shipped to the job.

631-5.4 ENGINEER'S RECORDS. The Engineer will keep an accurate record of each batch of materials used in the formulation of the seal coat.

METHOD OF MEASUREMENT

631-6.1 The refined coal tar emulsion with additives shall be measured by the gallon. Only the actual quantity of undiluted refined coal tar emulsion with additives will be measured for payment.

631-6.2 Aggregate shall be measured by the ton of dry aggregate.

BASIS OF PAYMENT

631-7.1 Payment shall be made at the contract unit price per square yard for the refined coal tar emulsion with additives ~~and at the contract price per ton for aggregate~~.

These prices shall be full compensation for furnishing all materials, preparing, mixing, and applying these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat - per Square Yard

TESTING REQUIREMENTS

29 CFR Part 1910.1200 Hazard Communication

ASTM C67 Standard Test Method for Sampling and Testing Brick and Structural Clay Tile

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D5727	Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type)

MATERIAL REQUIREMENTS

ASTM D490	Standard Specification for Road Tar
ASTM D692	Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
ASTM D3699	Standard Specification for Kerosene
ASTM D4866	Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formations Containing Mineral Aggregates and Optional Polymeric Admixtures

END OF ITEM P-631

ADDENDUM A

ITEM P-631 FUEL RESISTANCE TEST AND CRITERION

1. **Scope**

   This method determines the resistance of the coal tar emulsion seal coat to kerosene.

2. **Apparatus**

   2.1. Two 6" □□6" square 16 gauge sheet metal masks with a 4" □□4" square center removed

   2.2. 6" □□6" unglazed white ceramic tile with an absorption rate of 10- 18% (determined in accordance with ASTM C67

Brass ring, 2" diameter and 2" high

   2.3. Kerosene meeting requirements of ASTM D3699

   2.4. Silicone rubber sealant

3. **Procedure**

   3.1. Immerse the ceramic tile in distilled water for a minimum of ten minutes.

   3.2. Remove excess water from the tile to produce a damp surface before applying the seal coat.

   3.3. Using the mask described in 2.1 apply one layer of the coal tar emulsion mixture to the tile. Spread even with the top of the mask using a spatula or other straightedge.

   3.4. Allow the sample to cure for 96 hours at 77 ±2°F. and 50 ±10% relative humidity.

   3.5. Position a second mask on top of the first mask.

   3.6. Apply a second coat of coal tar emulsion mixture. Spread even with the top of the second mask.

   3.7. Cure as in step 3.4.

   3.8. After curing, affix the brass ring to the seal coat on the tile with silicone rubber sealant.

   3.9. Fill the brass ring with kerosene.

   3.10. After 24 hours, remove the kerosene from the brass ring, blot dry and immediately examine the film for softness and loss of adhesion. Immediately after the film is examined, break the tile in half, exposing that part of the tile whose film was subjected to the kerosene.

   3.11. Evaluate for penetration of kerosene through the sealer and loss of adhesion.

4. **Report**

   Report the results as pass or fail. Visible evidence of leakage or discoloration shall constitute failure of the fuel resistance test.

5. **Criterion:** A "pass" rating in the fuel resistance test is required prior to full production.

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ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding *fertilizing, and watering* the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

MATERIALS

901-2.1 SEED The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb/acre (or lb/1,000
Green Sprangletop	*	*	0.3
Bermudagrass	*	*	15.0
Sideoats Grama (Haskell)	*	*	4.5

Seeding shall be performed during the period between **January 15** and **May 15** inclusive, unless otherwise approved by the Engineer.

~~**901-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [ ] All liming materials shall conform to the requirements of ASTM C 602.~~

901-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be ***30-30-30*** commercial fertilizer and shall be spread at the rate of **150 pounds per acre.**

901-2.4 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and before applying fertilizer ~~and ground limestone~~, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer ~~and ground limestone~~, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be *completely eradicated by means of herbicide or tillage* ~~cut or otherwise satisfactorily disposed of~~, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 DRY APPLICATION METHOD.

~~**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.~~

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 WET APPLICATION METHOD.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb / sq inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 MAINTENANCE OF SEEDED AREAS. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

Watering of the seeded areas shall be coordinated with the Owner and Airport Operations. Contractor will not be permitted to enter the airport secure areas to water without advanced approval.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units **acres** measured on the ground surface, completed and accepted. *Seeding shall be measured to the nearest tenth (0.1) of an acre. Fertilizer and watering will not be measured for separate payment but will be considered subsidiary to seeding.*

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per **acre** or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-1	Seeding, Including Fertilizing and Watering - per acre

MATERIAL REQUIREMENTS

ASTM C 602	Agricultural Liming Materials
ASTM D 977	Emulsified Asphalt
FED SPEC JJJ-S-181	Seeds, Agriculture

END OF ITEM T-901

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ITEM T-904 SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

904-2.1 SOD. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. ~~At least 70% of the plants in the cut sod shall be composed of the species stated in the Texas Department of Transportation Standard Specifications, – *Sodding* special provisions, and~~ *Sod may be either of Bermuda grass or buffalo grass.* Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the ~~special provisions.~~ *Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 162. Sod must be free from noxious weeds, Johnson grass, seed producing grasses, or any other matter deleterious to the growth and subsistence of the sod.*

~~**904-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [___]. All liming materials shall conform to the requirements of ASTM C602.~~

904-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be standard commercial fertilizer and shall be spread at the rate *dictated by the representative soils test conducted by the contractor.*

904-2.4 WATER. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

904-2.5 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

904-3.1 GENERAL. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 PREPARING THE GROUND SURFACE. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

904-3.3 APPLYING FERTILIZER AND GROUND LIMESTONE. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches by discing, raking, or other suitable methods. Any stones larger than 2 inches in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 OBTAINING AND DELIVERING SOD. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 LAYING SOD. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 sq inch. The pegs shall be driven flush with the surface of the sod.

904-3.6 WATERING. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.7 ESTABLISHING TURF.

a. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

b. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

c. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

904-3.8 REPAIRING. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be sodded as specified in paragraph 904-3.5.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-1	Sodding - per square yard

MATERIAL REQUIREMENTS

ASTM C 602	Standard Specification for Agricultural Liming Materials

END OF ITEM T-904

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 TOPSOIL. *Topsoil source to be existing topsoil within the limits of the grading as shown on the Plans, and temporarily stockpiling topsoil on the airport property at a location acceptable to the airport and the Engineer.* Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. ~~The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117.~~ ~~*Topsoil testing shall be completed and paid for by the Contractor.*~~

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 INSPECTION AND TESTS. Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 GENERAL. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 PREPARING THE GROUND SURFACE. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of

capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 PLACING TOPSOIL. The topsoil shall be evenly spread on the prepared areas to a uniform depth of inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil obtained on the site shall be measured by the ***area in square yards of the specified thickness of topsoil re-handled and placed from the topsoil stockpiled under Item P-152-2.10 as accepted by the Engineer. Topsoiling measured for payment shall only be the planned limits of construction.*** ~~number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoiling by the Contractor shall be measured by the number of cubic yards of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

~~**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per ~~cubic yard~~ *square yard of the specified thickness* for topsoiling (obtained on the site). This price shall be full compensation for furnishing all materials and for all *stripping and stockpiling topsoil at the airport, hauling,* preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

~~**905-5.2** Payment will be made at the contract unit price per cubic yard for topsoiling (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

Payment will be made under:

Item T-905-1	Topsoiling (Obtained on Site or Removed from Stockpile; 2" Thickness) - per square yard

TESTING MATERIALS

ASTM C 117 Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

END OF ITEM T-905

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ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications, at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 WIND CONES. The primary wind cone assembly shall be Type L-807(L) (Rigid Supporting Structure), Style I-B (Internally Lighted), Size 2 (36" Diameter by 12' Long) meeting the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

107-2.3 ELECTRICAL WIRE AND CABLE. Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

107-2.5 PLASTIC CONDUIT (for use below grade only). Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete.

107-2.7 PAINT

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification - Paint 25, Primer, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

107-3.2 SUPPORT POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTIONS. The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

~~**107-3.4 BOOSTER TRANSFORMER.** If shown in plans or specified in the job specifications, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof housing. The booster transformer shall be installed as indicated in the plans and described in the proposal. If the booster transformer is required for installation remotely from the wind cone, it shall be installed in accordance with and paid for per as described in Item L-109, Airport Transformer Vault and Vault Equipment.~~

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 4 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

107-3.6 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

107-3.7 LIGHT SOURCES. The Contractor shall furnish and install lamps per the manufacturer's instruction book.

107-3.8 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

107-3.9 SEGMENTED CIRCLE. The segmented circle shall be constructed in accordance with AC 150/5340-5, Segmented Circle Airport Marker System, and the details in the Plans.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

107-4.2 The quantity of segmented circle airport marker systems to be paid for shall be the number of systems installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107-5.1	L-807(L), Style I-B, Size 2 Wind Cone and Foundation, in Place – per Each
Item L-107-5.2	Segmented Circle Marker System, in Place – per Each

MATERIAL REQUIREMENTS

AC 150/5340-5	Segmented Circle Airport Marker System
AC 150/5340-30	Design and Installation Details for airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description. Spec A-A-3067	*Paint: Alkyd, Exterior, Low VOC*
Fed. Spec. TT-P-664D	*Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant*
Fed. Spec. W-C-1094	*Conduit and Conduit Fittings, Plastic, Rigid*
FED STD 595	Colors Used in Government Procurement
MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit – Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit - Steel
NFPA-70	National Electric Code (NEC)

END OF ITEM L-107

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ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in Item L-110, Airport Underground Electrical Duct Banks and Conduits.

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual aid Facilities, Table 5-

1 and paragraph 5.1.3.1, with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. ~~Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 [Type B] [Type C], 5,000 volts, nonshielded, with [ethylene propylene insulation] [cross-linked polyethylene insulation].~~ L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for ground wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or an approved equivalent, used for potting the splice is acceptable.

b. The Field-Attached Plug-In Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

c. The Factory-Molded Plug-in Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The Taped or Heat-Shrink Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 TAPE. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 ELECTRICAL COATING. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 EXISTING CIRCUITS. Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be

performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders

shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

(1) When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.

(2) Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 Item.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 inches (75 mm) deep, loose measurement, and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the compaction requirements per Item P-152 for that area shall be followed.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inch (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, and seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep.

At the location of each underground cable connection, except at lighting units, or isolation transformers, or power a concrete marker slab must mark adapters placed above the connection. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

a. Equipotential. – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

b. Isolation – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables.

For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

For raceways installed under pavement; for raceways and cables not installed adjacent to the full strength pavement edge; for fixtures installed in full strength pavement and shoulder pavement ~~and for optional method of edge lights installed in turf (stabilized soils); and for raceways or cables adjacent to the full strength pavement edge~~, the counterpoise conductor shall be centered over the raceway or cable to be protected as described below.

The counterpoise conductor shall be installed no less than 8 inches (203 mm) above the raceway or cable to be protected, except as permitted below.

The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise conductor shall be installed no more than 12 inches (305 mm) above the raceway or cable to be protected.

The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection.

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

c. A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

d. For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

108-3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall include additional quantities required for slack.

~~**108-4.3** Ground rods shall be measured by each [10-foot] section installed complete.~~

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	Trenching for Direct-Buried Cable, 18 Inch Minimum Depth – per Linear Foot
Item L-108-5.2	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit – per Linear Foot
Item L-108-5.3	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.4	No. 1/0 AWG, Stranded, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.5	Trenching for Direct-Buried Bare Counterpoise Wire, 8" Minimum Depth – per Linear Foot
Item L-108-5.6	No. 6 AWG Stranded, 600V Rated, Type THHN/THWN-2 Cable, Installed in Duct Bank or Conduit – per Linear Foot
Item L-108-5.7	No. 8 AWG Stranded, 600V Rated, Type THHN/THWN-2, Green Insulated Equipment Ground, Installed in Duct Bank or Conduit – per Linear Foot

MATERIAL REQUIREMENTS

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D33	*Tinned Soft of Annealed Copper Wire for Electrical Purposes*
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive
MIL-P-21035	*Paint High Zinc Duct Content, Galvanizing Repair*

REFERENCE DOCUMENTS

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems
MIL-S-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

~~**110-2.2 STEEL CONDUIT.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10~~

~~mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.~~

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I – Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II – Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III – HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28-day compressive strength of 3500 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work

progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated

before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, and seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Non-Encased, Electrical Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.2	Non-Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.3	Non-Encased, Schedule 40 PVC Drain Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.4	Encased, Electrical Conduit, 1-Way 2"C, with Flowable Fill and Sawcut Pavement Repair – per Linear Foot
Item L-110-5.5	Concrete Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.6	FAA-Style, Concrete Encased, Split Duct Conduit, 1-Way 3"C – per Linear Foot

MATERIAL REQUIREMENTS

Advisory Circular (AC) 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NFPA-70	National Electrical Code (NEC)
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit - Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit Steel
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel*. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

~~**115-3.13 MANHOLE ELEVATION ADJUSTMENTS.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.~~

~~The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.~~

~~The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.~~

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections

- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

~~**115-4.2** Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.~~

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

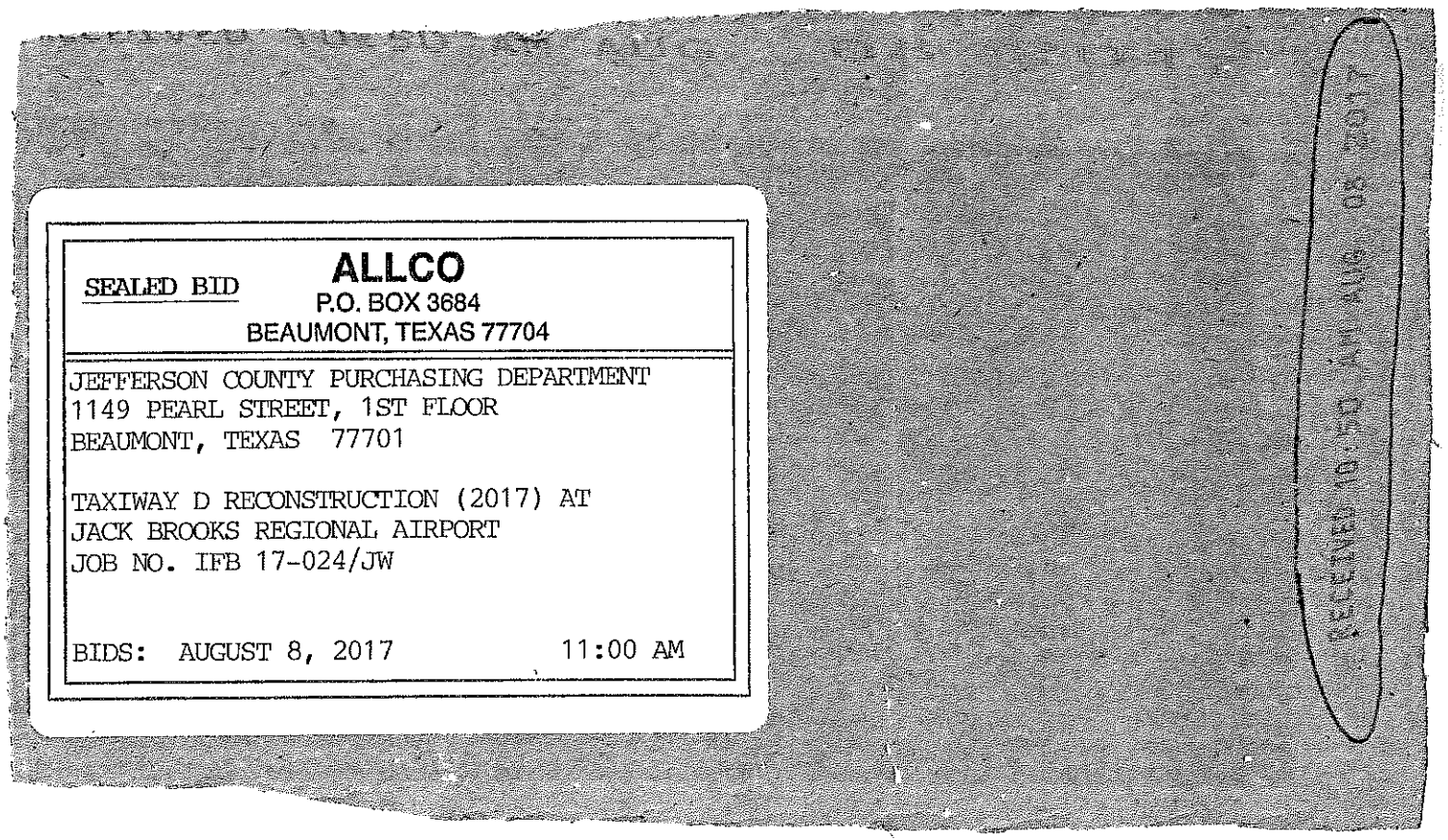
Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	FAA-Style, Precast Concrete Electrical Handhole, Aircraft-Rated, 3'Lx3'Wx3'D, Installed – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115



SEALED BID

ALLCO
P.O. BOX 3684
BEAUMONT, TEXAS 77704

JEFFERSON COUNTY PURCHASING DEPARTMENT
1149 PEARL STREET, 1ST FLOOR
BEAUMONT, TEXAS 77701

TAXIWAY D RECONSTRUCTION (2017) AT
JACK BROOKS REGIONAL AIRPORT
JOB NO. IFB 17-024/JW

BIDS: AUGUST 8, 2017 11:00 AM

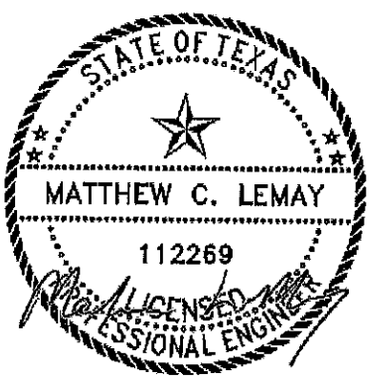
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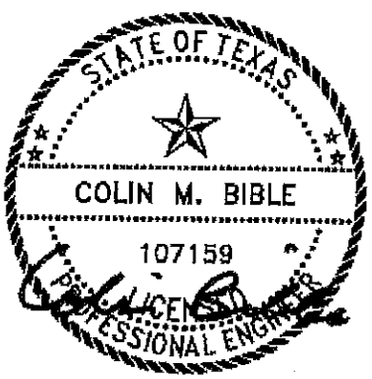
JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')

AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

Jefferson County Project 17-024/JW





Garver Project Number 17121501

July 2017

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')

AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

Jefferson County Project 17-024/JW



TEXAS REGISTERED ENGINEERING FIRM F-5713

Garver Project Number 17121501

June 2017

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SECTION A
ADVERTISEMENT AND INVITATION TO BID

JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah L. Clark, Purchasing Agent

1149 Pearl Street, 1st Floor, Beaumont, TX 77701 409-835-8593 Fax 409-835-8456

LEGAL NOTICE

Advertisement for Invitation for Bids

July 10, 2017

Notice is hereby given that sealed bids will be accepted by the Jefferson County Purchasing Department for IFB 17-024/JW, Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport . **Information for this project may be obtained from the Jefferson County website, http://www.co.jefferson.tx.us/Purchasing/main.htm or by calling 409-835-8593. Specifications, plans, and bidding documents can be obtained from CivCast website at https://www.civcastusa.com. Project ID is BPT_17-024/JW.**

Bids are to be sealed and addressed to the Purchasing Agent with the bid number and name marked on the outside of the envelope or box. Bidders shall forward an original and three (3) copies of their bid to the address shown below. Neither Jefferson County nor CivCast will accept bids submitted electronically. Late bids will be rejected as non-responsive. Bids will be publicly opened and read aloud in the Jefferson County Commissioners' Courtroom at the time and date below. Bidders are invited to attend the sealed bid opening.

BID NAME:	**Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport**
BID NO:	**IFB 17-024/JW**
DUE DATE/TIME:	**11:00 AM CDT, Tuesday, August 8, 2017**
MAIL OR DELIVER TO:	**Jefferson County Purchasing Department 1149 Pearl Street, 1st Floor Beaumont, Texas 77701**

There will be a pre-bid conference and walk-through at 10:00 AM CDT on Tuesday, July 25, 2017 in the Airport Administration Conference Room at 5000 Jerry Ware Blvd., Beaumont, Texas 77705. This conference will be bidder's only opportunity to view secured areas of the project.

The County shall require the bidder to furnish a bid security in the amount of five percent (5%) of the total contract cost. The bid bond must be executed with a surety company authorized to do business in the State of Texas. Within ten (10) days after the date of the signing of a contract, the bidder shall furnish a performance bond to the County for the full amount of the contract, if the contract exceeds one hundred thousand dollars ($100,000). If the contract is for one hundred thousand dollars ($100,000) or less, the County may provide that no money be paid to the contractor until completion and acceptance of the work or the fulfillment of the purchase obligation to the County.

Any questions relating to these requirements should be directed to Jamey West, Assistant Purchasing Agent, at 409-835-8593 or jwest@co.jefferson.tx.us

Jefferson County encourages Disadvantaged Business Enterprises to participate in the bidding process. Jefferson County does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in employment or the provisions of services. Individuals requiring special accommodations are requested to contact our office at 409-835-8593 to make arrangements no later than seven (7) calendar days prior to the submittal deadline. Jefferson County reserves the right to accept or reject any or all proposals, to waive technicalities and to take whatever action is in the best interest of Jefferson County.

All interested firms are invited to submit a bid in accordance with the terms and conditions stated in this bid.

Respondents are strongly encouraged to carefully read the entire invitation.

Deborah Clark

Deborah L. Clark, Purchasing Agent
Jefferson County, Texas

Publish: Beaumont Enterprise & Port Arthur News – July 12, 2017 and July 19, 2017

Bid Submissions:

Bidder is responsible for submitting:

- One (1) *original* bid copy to include a completed copy of this specifications packet, in its entirety.

- Written Number Here (# here) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

Additionally, Bidder must monitor the Jefferson County Purchasing Department Website (below) to see if addenda or additional instructions have been posted. Failure to return all required forms could result in a response being declared as non-responsive.

http://www.co.jefferson.tx.us/purchasing/main.htm

SECTION B
INSTRUCTIONS TO BIDDERS

Instructions to Bidders

1. Bid Submission

Bids must be submitted in complete original form by mail or messenger to the following address:

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, TX 77701

Bids will be accepted at the above address until the time and date specified herein, and immediately after will be publicly opened and read aloud.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked with the Bid Number, Bid Name, Bid Due Date, and the Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Late bids will not be accepted and will be returned unopened to the bidder.

All bids submitted in response to this invitation shall become the property of Jefferson County and will be a matter of public record available for review.

2. Bid Submissions During Time of Inclement Weather, Disaster, or Emergency

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a bid/proposal/statement of qualifications submission deadline, the bid closing will automatically be postponed until the next business day that County offices are open to the public. Should inclement weather conditions or any other unforeseen event cause delays in courier service operations, the County may issue an addendum to all known vendors interested in the project to extend the deadline. It will be the responsibility of the vendor to notify the county of their interest in the project should these conditions impact their ability to submit a bid/proposal/statement of qualifications submission before the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

Should an emergency or unanticipated event interrupt normal County processes, and bid/proposal/statement of qualifications submissions cannot be received by the Jefferson County Purchasing Department's office by the exact time specified in the IFB and urgent County requirements preclude amendment to the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first business day on which normal County processes resume.

3. Courthouse Security

Bidders are advised that all visitors to the Courthouse must pass through Security. **Bidders planning to hand deliver bids must allow time to get through Security, as a delay in entering the Courthouse will not be accepted as an excuse for late submittal.** Mondays and Tuesdays are particularly heavy days. Bidders are strongly urged to plan accordingly.

4. Preparation of Bids

The bid shall be legibly printed in ink or typed.

If a unit price or extension already entered is to be altered, it shall be crossed out and initialed in ink by the bidder.

The bid shall be legally signed and shall include the complete address of the bidder.

Jefferson County is exempt from Federal and State Sales Taxes, and such taxes shall not be included in bid prices.

5. Signatures

All bids, notifications, claims, and statements must be signed by an individual authorized to bind the bidder. The individual signing certifies, under penalty of perjury, that he or she has the legal authorization to bind the bidder.

6. County Holidays – 2017:

January 1st and 2nd	Sunday & Monday	New Year's Day
January 16	Monday	Martin Luther King, Jr. Day
February 20	Monday	President's Day
April 14	Friday	Good Friday
May 29	Monday	Memorial Day
July 4	Tuesday	Independence Day
September 4	Monday	Labor Day
November 10	Friday	Veterans Day
November 23rd & 24th	Thursday & Friday	Thanksgiving
December 25th	Monday	Christmas

7. Rejection or Withdrawal

Submission of additional terms, conditions or agreements with the bid document are grounds for deeming a bid non-responsive and may result in bid rejection. Jefferson County reserves the right to reject any and all bids and to waive any informalities and minor irregularities or defects in bids. Bids may be withdrawn in person by a bidder or authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the withdrawal is made prior to the time set for receipt of bids. Bids are an irrevocable offer and may not be withdrawn within 90 days after opening date.

8. Emergency/Declared Disaster Requirements

In the event of an emergency or if Jefferson County is declared a disaster area, by the County, State, or Federal Government, this Acceptance of Offer may be subjected to unusual usage. Contractor shall service the county during such an emergency or declared disaster under the same terms and conditions that apply during non-emergency/disaster conditions. The pricing as specified in this Acceptance of Offer shall apply to serving the County's needs regardless of the circumstances. If Contractor is unable to supply the services under the terms of the Acceptance of Offer, then Contractor shall provide proof of such disruption and a copy of the invoice from Contractor's supplier(s). Additional profit margin as a result of supplying services during an emergency or declared disaster shall not be permitted. In the event that additional equipment, supplies, and materials are required during the declared disaster, additional shipping, handling and drayage fees may apply.

9. Award

The bid will be awarded to the responsible, responsive bidder(s) whose bid, conforming to the solicitation, will be most advantageous to Jefferson County – price and other factors considered. Unless otherwise specified in this IFB, Jefferson County reserves the right to accept a bid in whole or in part, and to award by item or by group, whichever is deemed to be in the best interest of Jefferson County. Any bidder who is in default to Jefferson County at the time of submittal of the bid shall have that bid rejected. Jefferson County reserves the right to clarify any contractual terms with the concurrence of the Contractor; however, any substantial nonconformity in the offer, as determined by Jefferson County, shall be deemed non-responsive and the offer rejected.

In evaluating bids, Jefferson County shall consider the qualifications of the bidders, and, where applicable, operating costs, delivery time, maintenance requirements, performance data, and guarantees of materials and equipment. In addition, Jefferson County may conduct such investigation as it deems necessary to assist in the evaluation of a bid and to establish the responsibility, qualifications, and financial ability of the bidders to fulfill the contract.

Jefferson County reserves the right to award this contract on the basis of **lowest and best bid** in accordance with the laws of the State of Texas, to waive any formality or irregularity, to make awards to more than one offeror, and/or to reject any or all bids. In the event the lowest dollar offeror meeting specifications is not a awarded a contract, Offeror may appear before the Commissioners' Court and present evidence concerning Offeror responsibility after officially notifying the Office of the Purchasing Agent of Offeror's intent to appear.

10. Contract

A response to an IFB is an offer to contract with Jefferson County based upon the terms, conditions, and specifications contained in the IFB. Bids do not become contracts unless and until they are executed by Jefferson County, eliminating a formal signing of a separate contract. For that reason, all of the terms and conditions of the contract are contained in the IFB, unless any of the terms and conditions is modified by an IFB Amendment, a Contract Amendment, or by mutually agreed terms and conditions in the contract documents.

11. Waiver of Subrogation

Bidder and bidder's insurance carrier waive any and all rights whatsoever with regard to subrogation against Jefferson County as an indirect party to any suit arising out of personal or property damages resulting from bidder's performance under this agreement.

12. Fiscal Funding

A multi-year contract (if requested by the specifications) continuing as a result of an extension option must include fiscal funding out. If, for any reason, funds are not appropriated to continue the contract, said contract shall become null and void.

13. Bid Results

Bid results are not provided in response to telephone inquiries. A preliminary tabulation of bids received will be posted on the Purchasing web page (http://co.jefferson.tx.us/ purchasing/main.htm) as soon as possible following bid opening. A final tabulation will be posted following bid award, and will also be available for review in the Purchasing Department.

14. Changes and Addenda to Bid Documents

Each change or addendum issued in relation to this IFB document will be on file in the Office of the Purchasing Agent, and will be posted on the Purchasing web site as soon as possible. It shall be the bidder's responsibility to make inquiry as to change or addenda issued, and to monitor the web site. All such changes or addenda shall become part of the contract and all bidders shall be bound by such addenda. Information on all changes or addenda issued will be available at the Office of the County Purchasing Agent.

15. Specifications

Unless otherwise stated by the bidder, the bid will be considered as being in accordance with Jefferson County's applicable standard specifications, and any special specifications outlined in the bid document. References to a particular trade name, manufacturer's catalogue, or model number are made for descriptive purposes to guide the bidder in interpreting the requirements of Jefferson County, and should not be construed as excluding bids on other types of materials, equipment, and supplies. However, the bidder, if awarded a contract, will be required to furnish the particular item referred to in the specifications or description unless departure or substitution is clearly noted and described in the bid. Jefferson County reserves the right to determine if equipment/ product being bid is an acceptable alternate. All goods shall be new unless otherwise so stated in the bid. Any

unsolicited alternate bid, or any changes, insertions, or omissions to the terms and conditions, specifications, or any other requirements of the bid, may be considered non-responsive.

16. Delivery

Bids shall include all charges for delivery, packing, crating, containers, etc. Unless otherwise stated by the bidder (in writing on the included Bid Form), prices bid will be considered as being based on F.O.B. destination/delivered freight included.

17. Interpretation of Bid and/or Contract Documents

All inquiries shall be made within a reasonable time prior to the date and time fixed for the bid opening, in order that a written response in the form of an addendum, if required, can be processed before the bids are opened. Inquiries received that are not made in a timely fashion may or may not be considered.

18. Currency

Prices calculated by the bidder shall be stated in U.S. dollars.

19. Pricing

Prices shall be stated in units of quantity specified in the bid documents. In case of discrepancy in computing the amount of the bid, the unit price shall govern.

20. Notice to Proceed/Purchase Order

The successful bidder may not commence work under this contract until authorized to do so by the Purchasing Agent.

21. Certification

By signing the offer section of the Offer and Acceptance page, bidder certifies:

- The submission of the offer did not involve collusion or other anti-competitive practices.
- The bidder has not given, offered to give, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to any public servant in connection with the submitted offer.
- The bidder hereby certifies that the individual signing the bid is an authorized agent for the bidder and has the authority to bind the bidder to the contract.

22. Definitions

"County" – Jefferson County, Texas.

"Contractor" – The bidder whose proposal is accepted by Jefferson County.

23. Minority-Women Business Enterprise Participation

It is the desire of Jefferson County to increase the participation of Minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the County does not have any preference or set aside programs in place, it is committed to a policy of equitable participation for these firms.

General Conditions of Bidding and Terms of Contract

By execution of this document, the vendor accepts all general and special conditions of the contract as outlined below and in the specifications and plans.

1. Bidding

1.1 Bids. All bids must be submitted on the bid form furnished in this package.

1.2 Authorized Signatures. The bid must be executed personally by the vendor, duly authorized partner of the partnership, or duly authorized officer of the corporation. If executed by an agent, a power of attorney or other evidence of authority to act on behalf of the vendor shall accompany the bid to become a valid bid.

1.3 Late Bids. Bids must be in the office of the Jefferson County Purchasing Agent before or at the specified time and date bids are due. Bids received after the submission deadline shall be rejected as non-responsive and returned unopened.

1.4 Withdrawal of Bids Prior to Bid Opening. A bid may be withdrawn before the opening date by submitting a written request to the Purchasing Agent. If time allows, the bidder may submit a new bid. Bidder assumes full responsibility for submitting a new bid before or at the specified time and date bids are due. Jefferson County reserves the right to withdraw a request for bids before the opening date.

1.5 Withdrawal of Bids after Bid Opening. Bidder agrees that its offer may not be withdrawn or cancelled by the vendor for a period of ninety (90) days following the date and time designated for the receipt of bids unless otherwise stated in the bid and/or specifications.

1.6 Bid Amounts. Bids shall show net prices, extensions where applicable and net total. In case of conflict between unit price and extension, the unit price will govern. Any ambiguity in the bid as a result of omission, error, unintelligible or illegible wording shall be interpreted in the favor of Jefferson County.

1.7 Exceptions and/or Substitutions. All bids meeting the intent of the specifications and plans will be considered for award. Vendors taking exception to the specifications and plans, or offering substitutions, shall state these exceptions in the section provided. If bid is made on an article other than the one specified, which a bidder considers comparable, the name and grade of said article must be specified in the bid and sufficient specifications and descriptive data must accompany same to permit thorough evaluation. The absence of stated exceptions and/or substitutions shall indicate that the vendor has not taken any exceptions to the specifications and shall be responsible to perform in strict accordance with the specifications. As a matter of practice, Jefferson County rejects exception(s) and /or substitutions as non-responsive but reserves the right to accept any and/or all of the exception(s) and/or substitution(s) deemed to be in the best interest of Jefferson County.

1.8 Alternates. The Invitation for Bid and/or specifications may expressly allow bidder to submit an alternate bid. Presence of such an offer shall not be considered an indication of non-responsiveness.

1.9 Descriptions. Unless otherwise specified, any reference to make, manufacturer and/or model used in the bid specifications is merely descriptive and not restrictive, and is used only to indicate type, style, or quality of material desired.

1.10 Bid Alterations. Bids cannot be altered or amended after submission deadline. Any interlineations, alterations, or erasures made before opening time must be initialed by the signer of the bid, guaranteeing authenticity.

1.11 Tax Exempt Status. Jefferson County is exempt from federal excise tax and state sales tax. Unless the bid form or specifications specifically indicate otherwise, the bid price must be net, exclusive of above-mentioned taxes and will be so construed. Therefore, the bid price shall not include taxes.

1.12 Quantities. Quantities indicated are estimated quantities only and are not a commitment to buy. Approximate usage does not constitute an order, but only implies the probable quantity that will be used. Commodities will be ordered on an as-needed basis. Bidder is responsible for accurate final counts.

1.13 Bid Award. Award of contract shall be made to the most responsible, responsive bidder, whose offer is determined to be the best value, taking into consideration the relative importance of price. Jefferson County reserves the right to be the sole judge as to whether items bid will serve the purpose intended. Jefferson County reserves the right to accept or reject in part or in whole any bid submitted, and to waive any technicalities or informalities for the best interest of the County. Jefferson County reserves the right to award based upon individual line items, sections or total bid.

1.14 Silence of Specifications for Complete Units. All materials, equipment and/or parts that will become a portion of the completed work, including items not specifically stated herein but, necessary to render the service(s) complete and operational per the specifications, are to be included in the bid price. Vendor may be required to furnish evidence that the service, as bid, will meet or exceed these requirements.

1.15 Addenda. Any interpretations, corrections or changes to the specifications and plans will be made by addenda no later than forty-eight (48) hours prior to the bid opening. Addenda will be posted on the Purchasing web site. Vendors are responsible for monitoring the web site in order to remain informed on addenda. Vendors shall acknowledge receipt of all addenda with submission of bid.

1.16 General Bid Bond/Surety Requirements. Failure to furnish bid bond/surety, if requested, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.17 General Insurance Requirements. Failure to furnish Affidavit of Insurance, if required in these specifications, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.18 Responsiveness. A responsive bid shall substantially conform to the requirements of this Invitation to Bid and/or specifications contained herein. Bidders who substitute any other terms, conditions, specifications and/or requirements or who qualify their bids in such a manner as to nullify or limit their liability to the contracting entity shall have their bids deemed non-responsive. Also, bids containing any clause that would limit contracting authority shall be considered non-responsive. Examples of non-responsive bids include but shall not be limited to: a) bids that fail to conform to required delivery schedules as set forth in the bid request; b) bids with prices qualified in such a manner that the bid price cannot be determined, such as with vague wording that may include "price in effect at the time of delivery," and c) bids made contingent upon award of other bids currently under consideration.

1.19 Responsible Standing of Bidder. To be considered for award, bidder must at least: have the ability to obtain adequate financial resources, be able to comply with required or proposed

delivery/completion schedule, have a satisfactory record of performance; have a satisfactory record of integrity and ethics, and be otherwise qualified and eligible to receive award.

1.20 Proprietary Data. Bidder may, by written request, indicate as confidential any portion(s) of a bid that contain proprietary information, including manufacturing and/or design processes exclusive to the vendor. Jefferson County will protect from public disclosure such portions of a bid, unless directed otherwise by legal authority, including existing Open Records Acts.

1.21 Public Bid Opening. Bidders are invited to be present at the opening of bids. After the official opening of bids, a period of not less than one week is necessary to evaluate bids. The amount of time necessary for bid evaluation may vary and is determined solely by the County. Following the bid evaluation, all bids submitted are available for public review.

2. Performance

2.1 Design, Strength, and Quality. Design, strength, and quality of materials and workmanship must conform to the highest standards of manufacturing and engineering practices. The apparent silence of specifications and/or plans as to any detailed description concerning any point shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications and/or plans shall be made on the basis of this statement.

2.2 Age and Manufacture. All tangible goods being bid must be new and unused, unless otherwise specified, in first-class condition, of current manufacture, and furnished ready to use. All items not specifically mentioned that are required for a complete unit shall be furnished.

2.3 Delivery Location. All deliveries will be made to the address(es) specified on the purchase order during normal working hours of 8:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise authorized by the Purchasing Agent or designee.

2.4 Delivery Schedule. Delivery time may be an important consideration in the evaluation of best value. The maximum number of days necessary for delivery ARO shall be stated in the space, if provided, on the bid form.

2.5 Delivery Charges. All delivery and freight charges, F.O.B. destination shown on Jefferson County purchase order, as necessary to perform contract are to be included in the bid price.

2.6 Installation Charges. All charges for assembly, installation and set-up shall be included in the bid price. Unless otherwise stated, assembly, installation and set-up will be required.

2.7 Operating Instructions and Training. Clear and concise operating instructions and descriptive literature will be provided in English, if requested. On-site detailed training in the safe and efficient use and general maintenance of item(s) purchased shall be provided as needed at the request of Jefferson County. Instructions and training shall be at no additional cost to the County.

2.8 Storage. Bidder agrees to provide storage of custom ordered materials, if requested, for up to thirty (30) calendar days.

2.9 Compliance with Federal, State, County, and Local Laws. Bids must comply with all federal, state, county and local laws, including, but not limited to, all applicable standard safety, emission, and noise control requirements. Any vehicles or equipment shall contain all standard safety, emission, and noise control requirements required for the types and sizes of equipment at the time of their manufacture. The contractor agrees, during the performance of work or service, to comply with all applicable codes and ordinances of Jefferson County or the State of Texas as they may apply, as these laws may now read, or as they may hereafter be changed or amended.

2.10 OSHA. The bidder will certify all equipment complies with all regulations and conditions stipulated under the Williams-Steiger Occupational Safety and Health Act of 1971, as amended. The successful bidder will further certify that all items furnished under this project will conform and comply with federal and State of Texas OSHA standards. The successful bidder will agree to indemnify and hold harmless Jefferson County for any and all damages that may be assessed against the County.

2.11 Patents and Copyrights. The successful vendor agrees to protect the County from claims involving infringements of patents and/or copyrights.

2.12 Samples, Demonstrations and Testing. At Jefferson County's request and direction, bidder shall provide product samples and/or testing of items bid to ensure compliance with specifications. Samples, demonstrations and/or testing may be requested at any point prior to or following bid award. Samples, demonstrations and/or testing may be requested upon delivery and/or any point during the term of resulting contract. All samples (including return thereof), demonstrations, and/or testing shall be at the expense of the bidder/vendor.

2.13 Acceptability. All articles enumerated in the bid shall be subject to inspection by an officer designated for that purpose by Jefferson County. If found inferior to the quality called for, or not equal in value to the specifications, deficient in workmanship or otherwise, this fact shall be certified to the Purchasing Agent, who shall have the right to reject the whole or any part of the same. Items and/or work determined to be contrary to specifications must be replaced at the vendor's expense. Inferior items not retrieved by the vendor within thirty (30) calendar days, or an otherwise agreed upon time, shall become the property of the County. If disposal of such items warrants an expense, an amount equal to the disposal expense will be deducted from amounts payable to the vendor.

2.14 Maintenance. Maintenance required for equipment bid should be available in Jefferson County by a manufacturer authorized maintenance facility. Cost for this service shall be shown on the bid sheet as requested or on a separate sheet, as required. If Jefferson County opts to include maintenance, it shall be so stated in the purchase order and said cost will be included. Service will commence only upon expiration of applicable warranties and should be priced accordingly.

2.15 Material Safety Data Sheets. Under the "Hazardous Communications Act," common known as the "Texas Right to Know Act," a bidder must provide the user department, with each delivery, material safety data sheets which are applicable to hazardous substances defined in the Act. Failure of the bidder to furnish this documentation, will be cause to reject any bid applying thereto.

2.16 Evaluation. Evaluation shall be used as a determinant as to which services are the most efficient and/or most economical for the County. It shall be based on all factors having a bearing on price and performance of the items in the user environment. All bids are subject to tabulation by the Jefferson County Purchasing Department and recommendation to Jefferson County Commissioners' Court. Compliance with all bid requirements and needs of the using department are considered in evaluating bids. Pricing is not the only criteria for making a recommendation. The Jefferson County Purchasing Department reserves to right to contact any bidder, at any time, to clarify, verify or requirement information with regard to this bid.

3. Purchase Orders and Payment

3.1 Purchase Orders. A purchase order(s) shall be generated by the Jefferson County Purchasing Agent to the successful vendor. The purchase order number must appear on all itemized invoices and packing slips. The County will not be held responsible for any work orders placed and/or performed without a valid current purchase order number. Payment will be made for all ser-

vices rendered and accepted by the contract administrator for which a valid invoice has been received.

3.2 Invoices. All invoices shall reference the Purchase Order number. Invoices shall reference the bid item number or a detailed description for each item invoiced. If an item purchased and itemized on the invoice does not correspond to an item in any of the categories awarded to the vendor, invoice shall reference the item as "N/C" to indicate that it is a non-contract item. This requirement is to assist the County in verifying contract pricing on all invoices. Payment will be made under terms of net thirty (30) days unless otherwise agreed upon by seller and the purchasing department.

3.3 Prompt Payment. In accordance with the State of Texas Prompt Payment Act, Article 601f V.T.C.S., payment will be made after receive and acceptance by the County of the merchandise ordered and of a valid invoice. Successful bidder(s) is required to pay subcontractors within ten (10) days after the successful bidder receives payment from the County.

3.4 Funding. Jefferson County is operated and funded on an October 1 to September 30 basis; accordingly, the County reserves the right to terminate, without liability to the County, any contract for which funding is not available.

4. Contract

4.1 Contract Definition. The General Conditions of Bidding and Terms of Contract, Specifications, Plans, Bidding Forms, Addenda, and any other documents made a part of this bid shall constitute the complete bid. This bid, when duly accepted by Jefferson County, shall constitute a contract equally binding between the successful bidder and Jefferson County.

4.2 Change Order. No different or additional terms will become part of this contract with the exception of a change order. No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing and at the discretion and approval of Jefferson County. No change order will be binding unless signed by an authorized representative of the County and the vendor.

4.3 Price Re-determination. A price re-determination may be requested at the time of annual renewal. All requests for price re-determination shall be in written form. Cause for such request, i.e., manufacturer's direct cost, postage rates, Railroad Commission rates, Federal/State minimum wage law, Federal/State unemployment taxes, F.I.C.A, Insurance Coverage Rates, etc., shall be substantiated in writing by the source of the cost increase. The bidder's past experience of honoring contracts at the bid price will be an important consideration in the evaluation of the lowest and best bid. Jefferson County reserves the right to accept or reject any/all requests for price re-determination as it deems to be in the best interest of the County.

4.4 Termination. Jefferson County reserves the right to terminate the contract for default if the bidder breached any of the terms therein, including warranties of bidder or if the bidder becomes insolvent or commits acts of bankruptcy. Such right of termination is in addition to and not in lieu of any other remedies which Jefferson County may have in law or equity. Default may be construed as, but not limited to, failure to deliver the proper goods and/or service within the proper amount of time, and/or to properly perform any and all services required to Jefferson County's satisfaction and/or to meet all other obligations and requirements. Contracts may be terminated without cause upon thirty (30) days' written notice to either party unless otherwise specified. Jefferson County reserves the right to award canceled contract to the next lowest bidder. Bidder, in submitting this

bid, agrees that Jefferson County shall not be liable to prosecution for damages in the event that the County declares the bidder in default.

4.5 Conflict of Interest. Employees of the County are not permitted to maintain financial interest in, or receive payment, directly or indirectly, borrow from, lend to, invest in, or engage in any substantial financial transaction with any individual, organization, supplier, or subcontractor who does business with the County without disclosure. When conflict of interest is discovered, it shall be grounds for termination of contract.

4.6 Injuries or Damages Resulting from Negligence. Successful vendor shall defend, indemnify and save harmless Jefferson County and all its officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful vendor, or of any agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from bid award. Successful vendor shall pay any judgment with cost which may be obtained against Jefferson County growing out of such injury or damages.

4.7 Interest by Public Officials. No public official shall have interest in this contract, in accordance with Texas Local Government Code.

4.8 Warranty. The successful vendor shall warrant that all materials utilized in the performance of this contract shall conform to the proposed specifications and/or all warranties as stated in the Uniform Commercial Code and be free from all defects in material, workmanship and title.

4.9 Uniform Commercial Code. The successful vendor and Jefferson County agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

4.10 Venue. This agreement will be governed and construed according to the laws of the State of Texas. This agreement is performable in the County of Jefferson, Texas.

4.11 Sale, Assignment, or Transfer of Contract. The successful vendor shall not sell, assign, transfer or convey this contract, in whole or in part, without the prior written consent of Jefferson County.

4.12 Silence of Specifications. The apparent silence of these specifications as to any detailed description concerning any point, shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

Special Requirements/Instructions

The following requirements and instructions supersede General Requirements where applicable.

1. Bid Requirement

Each bidder shall ensure that required parts of the bid are completed with accuracy and submitted as per the requirements within this specifications packet, including any addenda.

Bidder is responsible for submitting one (1) *original* bid copy to include a completed copy of this specifications packet in its entirety; and three (3) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked "SEALED BID." The outside of the envelope or box shall also include: Bid Number, Bid Name, Bid Due Date, Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Jefferson County shall not be responsible for any effort or cost expended in the preparation of a response to this IFB. All protests should be coordinated through the Purchasing Office prior to award recommendation to Commissioners' Court.

2. Vendor Registration: SAM (System for Award Management).

Vendors doing business with Jefferson County are **required** to be registered with The System for Award Management (SAM), with an "active" status. The System for Award Management (SAM) is the Official U.S. Government system that consolidated the capabilities of CCR/FedReg, ORCA, and EPLS. There is NO fee to register for this site. Entities may register at no cost directly from the SAM website at: https://www.sam.gov

Bid Respondents are strongly encouraged to review their firm's SAM (System for Award Management) status prior to Bid Submission.

3. Awarded Vendor(s): Submission of FORM 1295 (Texas Ethics Commission)

As of January 1, 2016, per House Bill 1295, the Texas Ethics Commission (TEC) requires **all awarded vendors** to complete a Certificate of Interested Parties (FORM 1295) at time of notification of award. **Awarded Vendors** must visit the TEC website link below, enter the required information on Form 1295, and print a copy of the completed form. The form will include a certification of filing that will contain a unique certification number.

At the time of award, the Jefferson County Purchasing Department will submit a request to the Awarded Vendor to both:

1. Submit FORM 1295 online via the Texas Ethics Commission website link below.

2. Submit a printed copy of FORM 1295, signed by an Authorized Agent of the Awarded Vendor and notarized to the Jefferson County Purchasing Department.

FORM 1295, Completion Instructions, and Login Instructions are available via the Texas Ethics Commission Website at: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

4. Multiple Vendor Award

Jefferson County reserves the right to award this contract to more than one vendor at the County's discretion.

5. Delivery

If delivery is required, all items must be packaged so as to be protected from damage during shipping and handling. Any item(s) damaged in shipping must be replaced in kind, or repaired, by the contractor, at the discretion of, and at no additional charge to, Jefferson County.

6. Payment

Jefferson County will pay original invoices that clearly itemize the goods and/or services provided as to quantity, part number, description, price, applicable discount (if any), labor charges showing time differential, if applicable and if previously agreed to, and delivery, installation, and set-up costs, if applicable and if previously agreed to. Only charges as stated on the Bid Form(s) submitted as a part of the bid will be considered.

Invoices must indicate Jefferson County as applicable, the address to which the product(s) and/or service(s) were delivered, and the applicable purchase order number. Invoices will be matched to delivery tickets prior to payment; therefore, all delivery tickets should have an accurate description of the product(s) and/or service(s).

Invoices shall be submitted to: Jefferson County Auditing Department, Attention: Accounts Payable, 1149 Pearl Street, 7th floor, Beaumont, TX 77701.

7. Usage Reports

Jefferson County reserves the right to request, and receive at no additional cost, up to two (2) times during the contract period, a usage report detailing the products and/or services furnished to date under a contract resulting from this IFB. The reports must be furnished no later than five (5) working days after written request and itemize all purchases to date by Jefferson County department, description of each item purchased, including manufacturer, quantity of each item purchased, per unit and extended price of each item purchased, and total amount and price of all items purchased.

8. Insurance

The contractor (including any and all subcontractors as defined in Section 9.1.3 below) shall, at all times during the term of this contract, maintain insurance coverages with not less than the type and requirements shown below. Such insurance is to be provided at the sole cost of the contractor. These requirements do not establish limits of the contractor's liability.

All policies of insurance shall waive all rights of subrogation against the County, its officers, employees and agents; a copy of the policy wording or endorsement is required.

Contractor shall furnish Jefferson County with Certificate of Insurance naming Jefferson County as additional insured and will provide the actual policy wording or endorsement showing as such.

All insurance must be written by an insurer licensed to conduct business in the State of Texas.

Minimum Insurance Requirements

Public Liability, including Products & Completed Operations	$1,000,000
Excess Liability	$1,000,000

Property Insurance (policy below that is applicable to this project):
- Improvements & Betterments Policy: Improvements/Remodeling (for Lease Tenants)
- Builder's Risk Policy: Structural Coverage for Construction Projects
- Installation Floater Policy: Improvements/Alterations to Existing Structure

Workers' Compensation Statutory Coverage (see attached)

9. Workers' Compensation Insurance

9.1 Definitions:

9.1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

9.1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

9.1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly

with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

9.2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

9.3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Section 8 above.

9.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

9.5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

9.5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

9.5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

9.6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

9.7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

9.8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on

the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9.9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 9.1. – 9.7., with the certificates of coverage to be provided to the person for whom they are providing services.

9.10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

9.11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

Bidder Information Form

Instructions: Complete the form below. Please provide legible, accurate, and complete contact information. PLEASE PRINT.

Bid Name & Number: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport (IFB 17-024/JW)

Bidder's Company/Business Name: Mitchell Enterprises Ltd.

Bidder's TAX ID Number: 752314680

Contact Person: Shane Mitchell **Title:** Partner

Phone Number (with area code): (903) 893-6593

Alternate Phone Number if available (with area code):

Fax Number (with area code): (903) 868-0679

Email Address: shane@mitchellgc.com

Mailing Address (Please provide a physical address for bid bond return, if applicable):

700 N. Crockett Street
Address
Sherman, TX 75090
City, State, Zip Code

OFFER AND ACCEPTANCE FORM

OFFER TO CONTRACT

To Jefferson County:

We hereby offer and agree to furnish the materials or service in compliance with all terms, conditions, specifications, and amendments in the Invitation for Bid and any written exceptions in the offer. We understand that the items in this Invitation for Bid, including, but not limited to, all required certificates are fully incorporated herein as a material and necessary part of the contract.

The undersigned hereby states, under penalty of perjury, that all information provided is true, accurate, and complete, and states that he/she has the authority to submit this bid, which will result in a binding contract if accepted by Jefferson County.

We acknowledge receipt of the following amendment(s): 1, 2, 3, _____.

I certify, under penalty of perjury, that I have the legal authorization to bind the firm hereunder:

Mitchell Enterprises Ltd.
Company Name

700 N. Crockett Street
Address

Sherman, TX 75090
City State Zip

Signature of Person Authorized to Sign

Shane Mitchell
Printed Name

Partner
Title

For clarification of this offer, contact:

Shane Mitchell
Name

(903) 893-6593 (903) 868-0679
Phone Fax

shane@mitchellgc.com
E-mail

Bidder Shall Return Completed Form with Offer.

SECTION C
BID FORM AND PROPOSAL

BID FORM AND PROPOSAL

Place Sherman, Texas

Date 8/8/2017

Proposal of _____,

a corporation organized and existing under the laws of the State of _____,

or

Proposal of Mitchell Enterprises Ltd.,

a partnership consisting of Steve Mitchell, Tim Mitchell and Shane Mitchell

or

Proposal of _____,

an individual doing business as _____,

To: Jack Brooks Regional Airport

This bid results from your advertisement for bids for the construction of the **Taxiway D Reconstruction (2017), Ware Ramp to Taxiway 'F'.**

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents including all Addenda, and being familiar with all of the conditions relating to the construction of the proposed project, hereby agrees to comply with all other conditions or requirements set forth in the Plans, Specifications, and other Contract Documents, and further proposes to; furnish all material, supplies, equipment, and appliances; to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Plans, Specifications, and other Contract Documents at and for the unit prices proposed in the attached Bid Form(s).

The undersigned Bidder agrees to begin work within ten (10) calendar days after the issuance by, or on behalf of, the Owner of a "Work Order" or "Notice to Proceed" (except as modified in accordance with the GENERAL FAA PROVISIONS of these Contract Documents). Should the work fail to be completed within the time herein stated, the Contractor shall pay to the Owner, as fixed and agreed liquidated damages, and not as a penalty, the sum, for each day of delay until the work is completed and accepted, as stipulated in GENERAL FAA PROVISIONS of these Contract Documents. It is understood that additional time for the completion of the project is to be allowed only for delays as stipulated in GENERAL FAA PROVISIONS of these Contract Documents.

List of Plans

Drawing No.	Title
G-101	COVER SHEET
G-102	SHEET INDEX AND SUMMARY OF QUANTITIES
G-103	GENERAL NOTES
G-201	PROJECT LAYOUT AND SURVEY CONTROL PLAN
G-301	SAFETY AND PHASING PLAN
G-302	SAFETY AND PHASING DETAILS
G-303	SAFETY AND PHASING - PHASE I

Drawing No.	Title
G-304	SAFETY AND PHASING - PHASE II
G-305	SAFETY AND PHASING - PHASE III
G-401	GEOTECHNICAL INVESTIGATION PLAN
C-101	TYPICAL SECTIONS
C-201	SWPPP DETAILS I
C-202	SWPPP DETAILS II
C-203	SWPPP NOTES
C-204	SWPPP LAYOUT
C-301	EXISTING CONDITIONS LAYOUT I
C-302	EXISTING CONDITIONS LAYOUT II
C-401	DEMOLITION DETAILS
C-402	DEMOLITION LAYOUT
C-501	GRADING AND DRAINAGE DETAILS I
C-502	GRADING AND DRAINAGE DETAILS II
C-503	GRADING AND DRAINAGE PLAN I
C-504	GRADING AND DRAINAGE PLAN II
C-601	STORM DRAIN PROFILES AND CALCULATIONS I
C-701	GEOMETRIC PLAN I
C-702	GEOMETRIC PLAN II
C-801	PAVEMENT PROFILE I
C-802	PAVEMENT PROFILE II
C-901	JOINTING DETAILS
C-902	JOINT LAYOUT PLAN I
C-903	JOINT LAYOUT PLAN II
C-1001	JOINT ELEVATIONS LAYOUT I
C-1002	JOINT ELEVATIONS LAYOUT II
M-101	MARKING DETAILS
M-102	MARKING REMOVAL PLAN I
M-103	MARKING REMOVAL PLAN II
M-103	MARKING AND SIGNAGE LAYOUT I
M-104	MARKING AND SIGNAGE LAYOUT II
XS-101	TAXIWAY D CROSS SECTIONS I
XS-102	TAXIWAY D CROSS SECTIONS II
XS-103	TAXIWAY D CROSS SECTIONS III
XS-104	TAXIWAY D CROSS SECTIONS IV
XS-105	TAXIWAY D CROSS SECTIONS V
XS-106	TAXIWAY D CROSS SECTIONS VI
XS-107	TAXIWAY D CROSS SECTIONS VII
XS-108	TAXIWAY D CROSS SECTIONS VIII
XS-109	TAXIWAY D CROSS SECTIONS IX
XS-110	TAXIWAY D CROSS SECTIONS X
XS-111	TAXIWAY D CROSS SECTIONS XI
E-001	ELECTRICAL LEGEND AND NOTES
E-101	LIGHTING REMOVAL PLAN I
E-102	LIGHTING REMOVAL PLAN II

Drawing No.	Title
E-201	LIGHTING INSTALLATION PLAN I
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

Bidder acknowledges receipt of the following addendum (addenda):

Addendum No. 01 dated 7/25/17

Addendum No. 02 dated 8/2/17

Addendum No. 03 dated 8/4/17

The undersigned Bidder agrees that this bid shall be good and shall not be withdrawn for a period of ninety (90) calendar days after the opening thereof. If written notice of the acceptance of this Proposal is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the opening thereof, or at any time thereafter before this Proposal is withdrawn, the undersigned agrees to execute and deliver an Agreement (Contract) in the prescribed form, and furnish the required Performance and Payment Bond, within ten (10) days after the Agreement is presented to him for signature.

It is understood by the undersigned Bidder that the Owner reserves the right to reject any or all bids.

The following provisions are also included by reference:

- Davis Bacon Act (29 CFR Part 5.5)
- EEO Compliance Reports (41 CFR Part 60-1.7)
- Trade Restriction Certification (49 CFR Part 30)
- Buy American Preferences (Title 49 United States Code, Chapter 501)
- Certification of Non-Segregated Facilities (41 CFR Part 60-1.8)
- Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion (49 CFR Part 29)

Accompanying this Proposal as bid security is a certified check/bid bond (*strike one*)

in the amount of 5% GMP Dollars

($_____), being not less than five percent (5%) of the total amount of the bid for the base bid plus additive alternate no. 1 and additive alternate no. 2, as applicable. If the undersigned Bidder is the successful Bidder, but fails or refuses to execute the contract and furnish the required bond within the prescribed ten (10) days of the notification of award, then this bid security is to become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure or refusal.

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	1
Issued (Date):	July 25, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Rescheduled Walk-Throughs & Cut-off Date for Responses to Question Submissions

▪ Property Walk-Throughs

Please note that the original walk-through scheduled for Tuesday, July 25, 2017 *has been rescheduled.* Bidders will now have (2) opportunities to walk-through the airport property and view secured areas of the project, as follows:

Thursday, July 27, 2017 – 10:00 am CDT
Thursday, July 27, 2017 – 1:00 pm CDT

Bidders are to meet at the Jack Brooks Regional Airport, Administration Office (Lobby), 5000 Jerry Ware Blvd., Beaumont, Texas 77705.

This will be the bidder's only opportunity to walk-through the property and view secured areas of the project.

▪ Cut-off Date for Responses to Question Submissions

Bidders must submit technical questions via email to Colin Bible, Project Manager with Garver, LLC. at CMBible@GarverUSA.com **by 5:00 pm CDT, Tuesday, August 1, 2017** in order to receive a response.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Karal Livingston
Witness

Witness

Approved by CAS Date: 2/7/17

Authorized Signature (Bidder)

Partner
Title of Person Signing Above

Mitchell Enterprises Ltd.
Typed Name of Business or Individual

700 N. Crockett Street, Sherman, TX 75090
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	2
Issued (Date):	August 2, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Updating DBE Goals, Documenting Pre-Bid Meeting, and Updating existing electrical structure final grades.

- **Updating DBE Goals**

Please find attached the updated DBE Participation Forms. This reflects the new DBE Goals to be met.

- **Documenting Pre-Bid Meeting**

Please find attached the Pre-Bid meeting Agenda and the Pre-Bid meeting sign-in sheet.

- **Updating electrical structure final grades**

Please find attached the electrical drawings for the elevation adjustment of the electrical hand hole. This additional work warranted an update in the L-115 technical specification and pay item (L-115-5.3). The new L-115 specification is attached to this addendum along with the bid form featuring the updated pay item. Furthermore, the FAA-C-1391d specification governing the aforementioned adjustment has been added and so is the updated list of technical specifications.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Karol Livingston
Witness

Witness

Approved by _____ Date: 8/7/17

Authorized Signature (Bidder)

Partner
Title of Person Signing Above

Mitchell Enterprises Ltd.
Typed Name of Business or Individual

700 N. Crockett Street, Sherman, TX 75090
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT

1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	3
Issued (Date):	August 4, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Extending the Construction Schedule, and Changing the Method of Measurement for P-152 Material.

- **Extending the Construction Schedule**

The construction schedule has been extended from 274 calendar days to 359 calendar days. Please find attached the updated Construction Safety and Phasing sheets from the construction drawings reflecting the new phase durations. The project manual has also been edited to reflect the new schedule. The following project manual sections reference the construction duration and have therefore been updated and included in this addendum: The Template Notice to Proceed; The Bid Form; The Contract.

- **Changing the Method of Measurement for P-152 Material**

Borrow material – governed by the P-152 specification – shall no longer be measured for payment in its original position at the borrow pit. Instead, it shall be paid for based on plan quantities as stated in the amended and attached P-152 specification.

Addendum No. 3 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Karol Livingston
Witness

Witness

Approved by [illegible] Date: 8/7/17

[signature]
Authorized Signature (Bidder)

Partner
Title of Person Signing Above

Mitchell Enterprises Ltd.
Typed Name of Business or Individual

700 N. Crockett Street, Sherman, TX 75090
Address

MITCHELL ENTERPRISES LTD., 700 N. CROCKETT ST., SHERMAN, TX 75090

17-024JW Taxiway D Reconstruction - Jack Brooks Airport

BID FORM

LINE NO.	ITEM NO.	ITEM DESCRIPTION, WRITTEN AND NUMERIC PRICE	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	SECTION 105	**MOBILIZATION** Three Hundred Twenty Two Thousand Five Hundred Twenty Dollars and Eighty One Cents	1	LS	$ 322,520.81	$ 322,520.81
2	SS-120-1	**SITE PREPARATION** One Hundred Forty Three Thousand Four Hundred Seventy Five Dollars and No Cents	1	LS	176,048.94	176,048.94
3	SS-300-5.1	**LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES** Nine Thousand One Hundred Eighty Seven Dollars and No Cents	1	LS	$ 9,187.00	$ 9,187.00
4	SS-300-5.2	**NON-ENCASED, SCH 80 PVC CONDUIT, 1-WAY 1"C MOUNTED TO SURFACE FOR TEMPORARY EL** Twenty Thousand Three Hundred Fifty Dollars and No Cents	5000	LF	$ 4.07	$ 20,350.00
5	SS-301-5.1	**EXISTING CONCRETE ENCASED 2'WX2'L ELECTRICAL HANDHOLE REMOVED** One Thousand Twenty Seven Dollars and No Cents	1	EA	$ 1,027.00	$ 1,027.00
6	SS-301-5.2	**EXISTING CONCRETE ENCASED 3'WX3'L FAA-STYLE ELECTRICAL HANDHOLE REMOVED** Three Thousand Eight Hundred Fifty Eight Dollars and Ninety Nine Cents	3	EA	$ 1,286.33	$ 3,858.99
7	SS-301-5.3	**EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED** Five Thousand Three Hundred Seventy One Dollars and Eighty Six Cents	71	EA	$ 75.66	$ 5,371.86
8	SS-301-5.4	**EXISTING BASE MOUNTED EDGE LIGHT, REMOVED** One Hundred Ninety Five Dollars and No Cents	2	EA	$ 97.50	$ 195.00
9	SS-301-5.5	**EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN** Forty Nine Dollars and No Cents	1	EA	$ 49.00	$ 49.00
10	SS-301-5.6	**ABANDONED WIND CONE BASE, REMOVED** Five Hundred Seventy Six Dollars and No Cents	1	EA	$ 576.00	$ 576.00
11	SS-301-5.7	**EXISTING WIND CONE AND FOUNDATION REMOVED** One Thousand Six Hundred Twenty One Dollars and No Cents	1	EA	$ 1,621.00	$ 1,621.00
12	SS-301-5.8	**EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED** One Thousand Nine Hundred Forty Six Dollars and No Cents	1	EA	$ 1,946.00	$ 1,946.00
13	SS-301-5.9	**ABANDONDED SIGN BASE, REMOVED** Two Thousand Seventy Five Dollars and No Cents	4	EA	$ 518.75	$ 2,075.00

14	SS-301-5.10	**EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED** Fifteen Thousand Six Hundred Eighty Seven Dollars and Ninety Two Cents	19	EA	$ 825.68	$ 15,687.92
15	SS-301-5.11	**EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN** Seven Hundred Ninety Dollars and No Cents	4	EA	$ 197.50	$ 790.00
16	SS-301-5.12	**CONCRETE ENCASED DUCT BANK, REMOVE** Ten Thousand Four Hundred Thirteen Dollars and No Cents	650	LF	$ 16.02	$ 10,413.00
17	SS-305-5.1	**DIRECTIONAL BORING, 2 WAY 2"C POLYETHYLENE CONDUIT** Thirty Eight Thousand Nine Hundred Twelve Dollars and No Cents	400	LF	$ 97.28	$ 38,912.00
18	SS-310-5.1	**L-858(L) BASE MOUNTED, 2 MODULE GUIDANCE SIGN, INSTALLED** Fifteen Thousand Six Hundred Ninety Four Dollars and No Cents	4	EA	$ 3,923.50	$ 15,694.00
19	SS-310-5.2	**L-858(L) BASE MOUNTED, 3 MODULE GUIDANCE SIGN, INSTALLED** Twenty Thousand Eight Hundred Eighty Two Dollars and No Cents	4	EA	$ 5,220.50	$ 20,882.00
20	SS-310-5.3	**L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED** Fifty Seven Thousand Nine Hundred Sixty Dollars and Seventy Five Cents	75	EA	$ 772.81	$ 57,960.75
21	SS-310-5.4	**L-852T(L) LOW PROFILE IN PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED** Two Thousand Six Hundred Ten Dollars and No Cents	1	EA	$ 2,610.00	$ 2,610.00
22	SS-310-5.5	**FIELD LIGHTNING ARRESTOR, INSTALLED** Three Thousand Five Hundred Thirteen Dollars and No Cents	5	EA	$ 702.60	$ 3,513.00
23	SS-310-5.6	**VEHICLE SIGN ASSEMBLY, INSTALLED** Five Hundred Nineteen Dollars and No Cents	1	LS	$ 519.00	$ 519.00
24	D-701-1	**18IN RCP (CLASS III)** Twenty Six Thousand One Hundred Fifty Eight Dollars and No Cents	275	LF	$ 95.12	$ 26,158.00
25	D-751-1	**4'X4' SINGLE GRATE INLET (HD)** Six Thousand Four Hundred Five Dollars and No Cents	1	EA	$ 6,405.00	$ 6,405.00
26	D-751-2	**4'X4' JUNCTION BOX** Five Thousand Four Hundred Twenty Dollars and No Cents	1	EA	$ 5,420.00	$ 5,420.00
27	P-101-1	**CONCRETE PAVEMENT REMOVAL** One Hundred Eight Thousand One Hundred Ten Dollars and Ninety Five Cents	18355	SY	$ 5.89	$ 108,110.95
28	P-101-S	**MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING**	4239	SY	$ 15.71 ~~14.50~~	$ ~~61,465.50~~

		Sixty One Thousand Four Hundred Sixty Five Dollars and Fifty Cents				
29	P-152-1	**UNCLASSIFIED EXCAVATION** One Hundred Thirteen Thousand Four Hundred Ninety Dollars and No Cents	2250	CY	$ 50.44	$ 113,490.00
30	P-152-2	**BORROW EXCAVATION** Forty Five Thousand Forty Five Dollars and No Cents	5500	CY	$ 8.19	$ 45,045.00
31	P-152-3	**UNSUITABLE EXCAVATION** Nine Thousand One Hundred Eighty Seven Dollars and Fifty Cents	750	CY	$ 12.25	$ 9,187.50
32	P-154-1	**8IN SUBBASE COURSE** Two Hundred Ninety Nine Thousand Four Hundred Ninety Five Dollars and Twenty Eight Cents	15172	SY	$ ~~19.74~~ 28.06	$ ~~299,495.28~~ 425,726.32
33	P-155-1	**16IN LIME TREATED SUBGRADE** Two Hundred Forty Five Thousand Six Hundred Ninety Three Dollars and No Cents	16159	SY	$ 15.20	$ 245,693.00
34	P-155-2	**LIME MATERIAL** One Hundred Sixteen Thousand Seven Hundred Thirty Two Dollars and No Cents	600	TONS	$ 194.55	$ 116,732.00
35	P-156-1	**TEMPORARY EROSION CONTROLS** Fourteen Thousand Seven Hundred Eighty Seven Dollars and No Cents	1	LS	$ 14,787.00	$ 14,787.00
36	P-501-1	**12.5" PORTLAND CEMENT CONCRETE PAVEMENT** One Million Two Hundred Eleven Thousand Three Hundred Twenty Five Dollars and Twenty Four Cents	14359	SY	95	1,364,105
37	P-605-1	**CONCRETE JOINT CLEAN AND SEAL** Five Thousand Two Hundred Sixty Nine Dollars and No Cents	1500	LF	$ 3.51	$ 5,269.00
38	P-620-1	**RETRO-REFLECTIVE PAVEMENT MARKINGS** Fourteen Thousand Three Hundred Ten Dollars and No Cents	2650	SF	$ 5.40	$ 14,310.00
39	P-620-2	**NON-REFLECTIVE BLACK OUTLINE** Fifteen Thousand Three Hundred Fifty One Dollars and No Cents	4300	SF	$ 3.57	$ 15,351.00
40	P-620-3	**PAVEMENT MARKING REMOVAL** Four Thousand Six Hundred Forty Eight Dollars and No Cents	1	LS	$ 4,648.00	$ 4,648.00
41	P-631-7.1	**REFINED COAL TAR EMULSION W/ADDITIVES FOR SLURRY COAT** Thirty Eight Thousand Five Hundred Seventy Eight Dollars and Fifty Nine Cents	18637	SY	$ 2.07	$ 38,578.59
42	T-901-1	**SEEDING, INCLUDING FERTILIZATING AND WATERING** Fifty Three Thousand Five Hundred Eighty Nine Dollars and Two Cents	7.4	ACRES	$ 7,241.76	$ 53,589.02

43	T-904-1	**SODDING** Eighteen Thousand Two Hundred Twenty Two Dollars and Eighty Five Cents	1405	SY	$ 12.97	$ 18,222.85
44	T-905-1	**TOPSOILING (ONSITE)** One Hundred Twenty Five Thousand Four Hundred Twenty Four Dollars and Eighty One Cents	36567	SY	$ 3.43	$ 125,424.81
45	L-107-5.1	**L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION** Eight Thousand Two Hundred Forty One Dollars and No Cents	1	EA	$ 8,241.00	$ 8,241.00
46	L-107-5.2	**SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE** Sixteen Thousand Four Hundred Ninety Four Dollars and No Cents	1	EA	$ 16,494.00	$ 16,494.00
47	L-108-5.1	**TRENCHING FOR DIRECT-BURY CABLE, 18IN MIN DEPTH** Eight Hundred Twenty Eight Dollars and No Cents	300	LF	$ 2.76	$ 828.00
48	L-108-5.2	**NO 8 AWG, 5KV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT** Seventeen Thousand One Hundred Seventy Six Dollars and No Cents	15200	LF	$ 1.13	$ 17,176.00
49	L-108-5.3	**NO 6 AWG SOLID BARE COUTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE DUCTBANK OR CON** Eight Thousand Seven Hundred Eighty Two Dollars and No Cents	6500	LF	$ 1.35	$ 8,782.00
50	L-108-5.4	**NO 1/0 AWG, STRANDED BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH ABOVE THE DUCT** Six Hundred Twelve Dollars and Fifty Cents	350	LF	$ 1.75	$ 612.50
51	L-108-5.5	**TRENCHING FOR DIRECT-BURY COUNTERPOISE WIRE, 8" MIN** Ten Thousand Five Hundred Eighty Four Dollars and No Cents	5600	LF	$ 1.89	$ 10,584.00
52	L-108-5.6	**NO 6 AWG STRANDED, 600V RATED TYPE THNN/THWN CABLE IN DB OR CONDUIT** One Hundred Twenty Seven Dollars and Fifty Cents	150	LF	$ 0.85	$ 127.50
53	L-108-5.7	**NO 8 AWG STRANDED, 600V RATED TYPE THNN/THWN CABLE IN DB OR CONDUIT** Fifty Eight Dollars and Fifty Cents	75	LF	$ 0.78	$ 58.50
54	L-110-5.1	**NON ENCASED ELECTRICAL CONDUIT 1WAY-2IN C** Thirty Four Thousand Seven Hundred Seventy Six Dollars and No Cents	5600	LF	$ 6.21	$ 34,776.00
55	L-110-5.2	**NON ENCASED ELECTRICAL DUCT BANK, 2WAY 2IN C** Nine Hundred Eight Dollars and No Cents	70	LF	$ 12.97	$ 908.00
56	L-110-5.3	**NON ENCASED SCH 40PVC DRAIN CONDUIT, 1WAY 2IN C** One Thousand Two Hundred Seventy Eight Dollars and No Cents	225	LF	$ 5.68	$ 1,278.00

57	L-110-5.4	**ENCASED ELECTRICAL CONDUIT 1WAY 2IN C FLOWFILL & SAWCUT PAVEMENT REPAIR** Fourteen Thousand Eighty Dollars and No Cents	275	LF	$ 51.20	$ 14,080.00
58	L-110-5.5	**CONCRETE ENCASED ELECTRICAL DUCTBANK, 2WAY 2IN C** Two Thousand Seven Hundred Two Dollars and Fifty Cents	125	LF	$ 21.62	$ 2,702.50
59	L-110-5.6	**FAA-STYLE CONCRETE ENCASED SPLIT DUCT CONDUIT, 1WAY 3IN C** Fourteen Thousand Three Hundred Fifty Dollars and No Cents	700	LF	$ 20.50	$ 14,350.00
60	L-115-5.1	**CONCRETE ENCASED ELECTRICAL JUNCTION STRCT, L-867 CLASS 1, SIZE 12IN DIA, 24IN DPTH** Seven Hundred Seventy Dollars and No Cents	2	EA	$ 385.00	$ 770.00
61	L-115-5.2	**CONCRETE ENCASED ELECTRICAL JUNCTION STRCT, L-867 CLASS 1, SIZE 16IN DIA, 24IN DPTH** Three Thousand Three Hundred Sixty Dollars and No Cents	8	EA	$ 420.00	$ 3,360.00
62	L-115-5.3	**ADJUST MANHOLE TO NEW GRADE, PROVIDE NEW FAA RATED COVER** Two Thousand One Hundred Thirty One Dollars and No Cents	1	EA	$ 2,131.00	$ 2,131.00
		BASE BID TOTALS				3,672,000

It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Three-Hundred and Fifty-Nine (359)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST:_____ By_____

_____ Title:_____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST:_____ By _____

_____ Title:_____
(Print the names underneath all signatures)

Bid Affidavit

The undersigned certifies that the bid prices contained in this bid have been carefully reviewed and are submitted as correct and final. Bidder further certifies and agrees to furnish any and/or all commodities upon which prices are extended at the price offered, and upon the conditions contained in the specifications and the Notice to Bidders.

STATE OF TEXAS COUNTY OF GRAYSON

BEFORE ME, the undersigned authority, a Notary Public in and for the State of TEXAS,

on this day personally appeared S. Shane Mitchell (name), who

after being by me duly sworn, did depose and say:

"I, S. Shane Mitchell (name) am a duly authorized officer of/agent

for Mitchell Enterprises Ltd. (name of firm) and have been duly authorized to execute the

foregoing on behalf of the said Mitchell Enterprises Ltd. (name of firm).

I hereby certify that the foregoing bid has not been prepared in collusion with any other bidder or other person or persons engaged in the same line of business prior to the official opening of this bid. Further, I certify that the bidder is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities bid on, or to influence any person or persons to bid or not to bid thereon."

Name and address of bidder: Mitchell Enterprises Ltd.

700 N. Crockett Street, Sherman, TX 75090

Fax: 903-868-0679 Telephone# 903-893-6593

by: S. Shane Mitchell (print name) Title: Partner

Signature:

SUBSCRIBED AND SWORN to before me by the above-named S. Shane Mitchell on

this the 7th day of August, 2017.

KAROL LIVINGSTON
Notary Public, State of Texas
ID # 1197829-2
My Commission Expires
05-29-2020

Karol Livingston
Notary Public in and for
the State of TEXAS

Bidder Shall Return Completed Form with Offer.

SECTION D
STATEMENT OF BIDDER'S QUALIFICATIONS

010420 – STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder: *Mitchell Enterprises, Ltd.*

2. Permanent main office address.: *700 N. Crockett*
   Sherman, Texas 75090

3. When organized.: *1966*

4. If a corporation, where incorporated.:

   Mitchell Enterprises was incorporated in 1990.
   Prior to that time Mitchell was incorporated as Emcon, Inc. in 1967.
   In 1980 Mitchell was incorporated as Mit-Con, Inc.
   In 1990 Mitchell was incorporated as Mitchell Enterprises, Inc.
   In 2002 Mitchell was changed to a Limited Partnership

5. How many years have been engaged in the contracting business under your present firm or trade name?
   25 years

6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion).

CURRENT PROJECTS — AS OF 7/31/2017

PROJECTS:	OWNER:	PHONE NUMBER:	ARCHITECT/ ENGINEER:	PHONE NUMBER:	CONTRACT AMOUNT	% COMPLETE:	SCHEDULED COMPLETION:
Paris Cox Field Municipal Airport Hanger and Apron Additions Paris, TX	City of Paris, TX TxDOT Aviation	Mr. Lance City of Wichita Falls, TX (940) 761-7640	KSA Engineers 8875 Synergy Drive McKinney, TX	Mr. Trevor Self (972) 542-2995	$885,000.00	60%	Aug-17
Georgetown Municipal Airport Parallel Taxiway & Airfield Imprvmt Georgetown, TX	City of Georgetown, TX TxDOT Aviation	Mr. Ed Mayle TxDOT Aviation (512) 416-4500	Garver Engineering Round Rock, TX	Mr Zac Simpson, P.E. (972) 377-7480	$6,779,146.12	80%	Sep-17
TOTAL UNDER CONTRACT					$ 7,664,146.12		

General character of work performed by your company.

Current work is mostly airport related work. That work has been targeted to comprise at least 50% of our work load. We are also targeting water work related projects and have historically had that interest and ability.

From 1966 until about 1995 Mitchell was involved exclusively in vertical building structures and from 1975 until 2005, most of the work was performed for Federal Contracting branches (GSA, Army Corps of Engineers, Dept. of Navy, and Dept. of Agriculture) and Texas Independent School Districts. From 2005 until present, our work has been exclusively Civil related projects.

Looking forward, we anticipate our work to be 90% civil related infrastructure.

7. Have you ever failed to complete any work awarded to you?

   No

8. Have you ever defaulted on a Contract?

   No

   a. If so, where and why? *Not applicable*

9. Have you ever been fined or had your license suspended by a Contactor's Licensing Board?

   No

10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year complete.

PROJECTS:	OWNER:	PHONE NUMBER:	ARCHITECT/ ENGINEER:	PHONE NUMBER:	CONTRACT AMOUNT:	DATE OF COMPLETION:
Improvements to Victoria Regional Airport, Victoria, Texas	City of Victoria, Texas	Jason Milewski 361-578-2704	Argus Engineering Blue Springs, MO	Mr. Dan Franks (816) 874-8238	$1,057,000.00	Jan-13
LEDA Railport EDA Grant Improvements Lubbock LEDA	Lubbock LEDA Lubbock, Texas		Parkhill, Smith, Cooper Lubbock, Texas	Mr. Jonathan Ziegner (806) 473-2200	$1,338,000.00	Jun-13
Waco Regional Airport Improvements, Phase II	City of Waco, Texas	Joel C. Martinez, Aviation Director 254-750-8657	Garver Engineering Frisco, Texas	Mr. Frank McIlwain, PE (972) 377-7480	$3,470,000.00	Nov-14
State Highway 23-Road Reconstruction, Lipscomb County Texas	TxDOT	Mr. Kenneth Corse, PE 806-665-2374	Texas Department of Transportation Austin, TX	See Kenneth Corse phone	$5,507,000.00	Dec-14

Perryton-Ochiltree County Airport Taxiway and Apron Improvements	Perryton-Ochiltree County	TxDOT Aviation Stephanie Kleiber P.E. (512) 416-4521	Parkhill, Smith, Cooper Amarillo, Texas	Mr. Michael Krusing (806) 335-1600	$6,504,000.00	Dec-14
Samuel B. Cornelius Field, TxDOT Aviation, Spearman, Texas	City of Spearman, Texas TxDOT Aviation	TxDOT Aviation Stephanie Kleiber P.E. (512) 416-4521	KSA Engineerss Clayton Scales, PE	Clayton Scales, PE (806) 335-1600	$1,819,774.40	Mar-16
South TX International Airport Hanger and Apron Imprvmnts Edinburg, TX	City of Edinburg, Texas TxDOT Aviation	Ms. Debra Melvin STIA Airport Manager (956) 292-2047	KSA Engineers Sugar Land, TX	Mr. Nathan Mikell (281) 494-3252	$420,000.00	Jun-17
WF Regional Airport Taxiway Charlet Rehabilitation Wichita Falls, TX	City of Wichita Falls, TX	Mr. John Burris City of Wichita Falls, TX (940) 761/7640	Garver Engineering Frisco, Texas	Mr. Colin Bible (972) 377-7480	$4,250,365.00	Jun-17

11. List your major equipment available for this contract.

AVAILABLE EQUIPMENT LIST

Owned by Mitchell Enterprises, Ltd.

Item	Quantity	Description and Capacity	
1	25	Vehicles and Trailers	
2	1	Tandem Haul Truck	
3	1	18 ton Hydraulic Rough Terrain Crane	
4	1	40 ton Hydraulic Rough Terrain Crane	
5	3	Manlifts and Forklifts	
6	3	Track Loaders	
7	2	Track Dozer	
8	2	Track Excavators	
9	2	Mini Track Excavators	
10	4	Tractor Backhoe Loaders	
11	2	Vibratory Sheepsfoot Equipment	
12	2	Vibratory Sheepsfoot Equipment	
13	2	Bomag Pulvi-Mixer	
14	3	Various other Air Compressors	
15	3	Welders	
16	4	Concrete Saws	
17	Multiple	Surveying Equipment	
18		Etc.	

12. Experience in construction work similar in importance to this project.

Mitchell Enterprise has been actively involved with municipalities and TxDOT Aviation on airport and hanger projects statewide since 2010. Refer to the prior projects listing for applicable aviation construction projects.

13. Background and experience of the principal member of your organization, including the officers.

Steve Mitchell- Partner

BSCE 1975, University of Texas at Arlington
Worked a while for Texas Utilities. Joined family construction business in 1977.
From 1977 until 1980, took control of the business. In 1980, took operating- control and financial responsibilities of the company.
Principal Owner-Principal Operating Officer

Tim Mitchell-Partner
University of Texas at Arlington Civil Engineering program.
Joined company in 1985.
Tim is serves as Senior Project Management.
Also performs larger scale individual project management

Shane Mitchell - Partner
Business Finance degree, Southwest Texas State University, 1997
Joined Mitchell Enterprises in 1998. Chief Financial Officer
Performs specialized project management
Special skills with civil and water works projects-including survey, BIM & 3D modeling

14. Credit Available:

I would estimate the available line of credit to be $5 million to $6 million. Mitchell does not presently utilize the line of credit.

15. Give bank reference:

Mr. Paul Bailey
President
Texas Star Bank-Sherman
903-893-9555

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner?

Yes

17. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner, in verification of the recitals comprising this statement of Bidder's Qualification.

Statement Affirmed

18. The Bidder shall provide a brief description of any litigation or administrative proceeding of the following types, either pending or concluded within the preceding year, to which the Bidder (and the ultimate controlling person, if different from the Bidder) or any of its directors or executive officers was a party or of which the property of any such person is or was the subject; the names of the parties and the court or agency in which such litigation or proceeding is or was pending shall be given:
    a. Administrative or judicial proceedings of any state federal agency or authority concerning environmental violations;
    b. Proceedings which may have a material effect upon the solvency of the ultimate holding company, including by not necessarily limited to, bankruptcy and receivership; and
    c. Criminal proceedings.

Mitchell Enterprises has no history or pending litigation per question 20

Dated at Sherman, TX, this 7th day of August, 2017.

Mitchell Enterprises, Ltd.

By_____
S. Shane Mitchell
Title: Partner

STATE OF TEXAS)

COUNTY OF GRAYSON)

S. Shane Mitchell being duly sworn deposes and says that he is a

Partner of Mitchell Enterprises, Ltd

And that the answers to the foregoing questions and all statements therein contained are True and correct.
SUBSCRIBED AND SWORN TO BEFORE ME this 7th day of August, 2017 .

_____
(Notary Public)

My Commission Expires:

_____

Bidder Shall Return Completed Statement with Offer.

CONFLICT OF INTEREST QUESTIONNAIRE

CONFLICT OF INTEREST QUESTIONNAIRE **FORM CIQ**
For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY
Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**
Mitchell Enterprises Ltd.

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**
(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information in this section is being disclosed.**
Not Applicable
Name of Officer

This section (item 3 including subparts A, B, C, & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more?

☐ Yes ☐ No

D. Describe each employment or business and family relationship with the local government officer named in this section.

4
Signature of vendor doing business with the governmental entity

8/7/2017
Date

Bidder Shall Return Completed Form with Offer.

LOCAL GOVERNMENT OFFICER
CONFLICTS DISCLOSURE STATEMENT – (OFFICE USE ONLY)

LOCAL GOVERNMENT OFFICER **FORM CIS**
CONFLICTS DISCLOSURE STATEMENT

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This is the notice to the appropriate local governmental entity that the following local government officer has become aware of facts that require the officer to file this statement in accordance with Chapter 176, Local Government Code.

OFFICE USE ONLY

Date Received

1 **Name of Local Government Officer**

Not Applicable

2 **Office Held**

Not Applicable

3 **Name of vendor described by Sections 176.001(7) and 176.003(a), Local Government Code**

Not Applicable

4 **Description of the nature and extent of employment or other business relationship with vendor named in item 3**

Not Applicable

5 **List gifts accepted by the local government officer and any family member, if aggregate value of the gifts accepted from vendor named in item 3 exceeds $100 during the 12-month period described by Section 176.003(a)(2)(B).**

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

Not Applicable

(attach additional forms as necessary)

6 **AFFIDAVIT**

I swear under penalty of perjury that the above statement is true and correct. I acknowledge that the disclosure applies to each family member (as defined by Section 176.001(2), Local Government Code) of this local government officer. I also acknowledge that this statement covers the 12-month period described by Section 176.003(a)(2)(B), Local Government Code.

Not Applicable
Signature of Local Government Officer

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20_____, to certify which, witness my hand and seal of office.

Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath

Adopted 8/7/2015

Vendor References

Please list at least three (3) companies or governmental agencies (preferably a municipality) where the same or similar products and/or services as contained in this specification package were recently provided.

THIS FORM MUST BE RETURNED WITH YOUR BID.

REFERENCE ONE

Government/Company Name: City of Edinburg, TX

Address: 1300 FM 490, Edinburg, TX 78542

Contact Person and Title: Debra Melvin, Airport Manager

Phone: (956) 292-2047 Fax:

Email Address: dmelvin@cityofedinburg.com Contract Period: 11/16 to 6/17

Scope of Work: Aviation Taxiway, Parking and Hanger

REFERENCE TWO

Government/Company Name: City of Paris, TX

Address:

Contact Person and Title: Lance Nicholson, City of Paris Engineering

Phone: (903) 784-9247 Fax: (903) 784-1798

Email Address: lnicholson@paristexas.gov Contract Period: 12/16 to 8/17

Scope of Work: Aviation Apron, Hanger

REFERENCE THREE

Government/Company Name: Texas Department of Transportation, Aviation Division

Address: 150 E. Riverside Drive, Austin, TX 78704

Contact Person and Title: Ed Mayle, Aviation Project Manager

Phone: (512) 416-4500 Fax:

Email Address: Ed.Mayle@txdot.gov Contract Period: 1/12 to 8/17

Scope of Work: Statewide aviation projects

Bidder Shall Return Completed Form with Offer.

SECTION E
DBE PARTICIPATION AND RESIDENCE CERTIFICATION REPORTING

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: _____ DBE: ☐ Yes ☐ No

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____

Prime Contract Amount: $ _____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

_____ _____ _____
Printed Name of Contractor Representative Signature of Representative Date

_____ _____ _____
Printed Name of DBE Signature of Representative Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Prime Contractor: _____ DBE: ☐ Yes ☐ No

DBE Status (Gender & Ethnicity): _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____ IFB/RFP No.: _____

Total Contract: $ _____ Total DBE Subcontract(s): $ _____

Construction DBE Goals: 12.62% DBE:: _____ %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☐ Other: _____

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☐ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required**. I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): _____

Title: _____

Signature: _____

Date: _____

E-mail address: _____

Contact person that will be in charge of invoicing for this project:

Name (print or type): _____

Title: _____

Date: _____

E-mail address: _____

Bidder Shall Return Completed Form with Offer.

GOOD FAITH EFFORT (GFE) DETERMINATION CHECKLIST

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions: In order to determine if a "Good Faith Effort" was made in soliciting DBEs for subcontracting opportunities, the following checklist and supporting documentation shall be completed by the Prime Contractor/Consultant, and returned with the Prime Contractor/ Consultant's bid. This list contains the **minimum** efforts that should be put forth by the Prime Contractor/Consultant when attempting to achieve or exceed the goals of DBE Subcontractor participation. The Prime Contractor/Consultant may extend his/her efforts in soliciting DBE Subcontractor participation beyond what is listed below.

Did the Prime Contractor . . .

☐ Yes	☐ No	1. To the extent practical, and consistent with standard and prudent industry standards, divide the contract work into the smallest feasible portions, to allow for maximum DBE Subcontractor participation?
☐ Yes	☐ No	2. **Notify** in writing a reasonable number of DBEs, allowing sufficient time for effective participation of the planned work to be subcontracted?
☐ Yes	☐ No	3. **Provide** DBEs that were genuinely interested in bidding on a subcontractor, adequate information regarding the project (i.e., plans, specifications, scope of work, bonding and insurance requirements, and a point of contract within the Prime Contractor/Consultant's organization)?
☐ Yes	☐ No	4. **Negotiate** in good faith with interested DBEs, and not reject bids from DBEs that qualify as lowest and responsive bidders?
☐ Yes	☐ No	5. **Document** reasons DBEs were rejected? Was a written rejection notice, including the reason for rejection, provided to the rejected DBEs?
☐ Yes	☐ No	6. If Prime Contractor/Consultant has zero (0) DBE participation, **please explain the reasons why.**

If "No" was selected, please explain and include any pertinent documentation with your bid.
If necessary, please use a separate sheet to answer the above questions.

_____ _____
Printed Name of Authorized Representative Signature

_____ _____
Title Date

Bidder Shall Return Completed Form with Offer.

RESIDENCE CERTIFICATION/TAX FORM

Pursuant to Texas Government Code §2252.001 *et seq.*, as amended, Jefferson County requests Resident Certification. §2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of §2252.001 are stated below:

(3) "Nonresident bidder" refers to a person who is not a resident.

(4) "Resident bidder" refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

☐ I certify that Mitchell Enterprises Ltd. [company name] is a Resident Bidder of Texas as defined in Government Code §2252.001.

☐ I certify that _____ [company name] is a Nonresident Bidder as defined in Government Code §2252.001 and our principal place of business is _____ _____ (city and state).

Taxpayer Identification Number (T.I.N.):	17523146805
Company Name submitting bid/proposal:	Mitchell Enterprises Ltd.
Mailing address:	700 N. Crockett Street, Sherman, TX 75090
If you are an individual, list the names and addresses of any partnership of which you are a general partner:	

Property: List all taxable property owned by you or above partnerships in Jefferson County.

Jefferson County Tax Acct. No.*	Property address or location**

* This is the property amount identification number assigned by the Jefferson County Appraisal District.

** For real property, specify the property address or legal description. For business property, specify the address where the property is located. For example, office equipment will normally be at your office, but inventory may be stored as a warehouse or other location.

Bidder Shall Return Completed Form with Offer.

SECTION F
BID SURETY

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)
Mitchell Enterprises, Ltd.
P.O. Box 3109
Sherman, TX 75091

SURETY:
(Name, legal status and principal place of business)
Hartford Fire Insurance Company
3000 Internet Drive, Suite 600
Frisco, TX 75034-1991

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:
(Name, legal status and address)
Jefferson County Purchasing Department
1149 Pearl St. 1st Floor
Beaumont, TX 77701

BOND AMOUNT:
Five Percent Of Greatest Amount Bid (5% of GAB)

PROJECT:
(Name, location or address, and Project number, if any)
Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport, Project 17-024/JW

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 8th day of August 2017 .

Karol Livingston
(Witness)

Mitchell Enterprises, Ltd.
(Principal) *(Seal)*

(Title)

Hartford Fire Insurance Company
(Surety) *(Seal)*

Kristi Meek
(Witness)

(Title) Kristi Meek , Attorney-In-Fact

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.

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0311/10

IMPORTANT NOTICE

To obtain information or make a complaint:

You may contact your agent.

You may call Hartford Insurance Group at the toll free telephone number for information or to make a complaint at:

1-800-392-7805

You may also write to The Hartford:

The Hartford
Hartford Financial Products
2 Park Avenue, 5th Floor
New York, New York 10016
1-212-277-0400

You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights or complaints at:

1-800-252-3439

You may write the Texas Department of Insurance

P.O. Box 149104
Austin, TX 78714-9104
Fax Number (512) 490-1007
Web: http://www.tdi.state.tx.us
E-mail: ConsumerProtection@tdi.state.tx.us

PREMIUM OR CLAIMS DISPUTES: Should you have a dispute concerning your premium or about a claim you should contact the agent first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR POLICY: This notice is for your information only and does not become a part or condition of the attached document.

AVISO IMPORTANTE

Para obtener informacion o para someter una queja.

Puede comunicarse con su agente.

Usted puede llamar al numero de telefono gratis de The Hartford Insurance Group para informacion o para someter una queja al

1-800-392-7805

Usted tambien puede escribir a The Hartford.

The Hartford
Hartford Financial Products
2 Park Avenue, 5th Floor
New York, New York 10016
1-212-277-0400

Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de compañías, coberturas, derechos o quejas al:

1-800-252-3439

Puede escribir al Departamento de Seguros de Texas

P.O. Box 149104
Austin, TX 78714-9104
Fax Number (512) 490-1007
Web: http://www.tdi.state.tx.us
E-mail: ConsumerProtection@tdi.state.tx.us

DISPUTAS SOBRE PRIMAS O RECLAMOS: Si tiene una disputa concerniente a su prima o a un reclamo, debe comunicarse con su agente primero. Si no se resuelve la disputa, puede entonces comunicarse con el departamento (TDI).

UNA ESTE AVISO A SU POLIZA: Este aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.

POWER OF ATTORNEY

Direct Inquiries/Claims to:
THE HARTFORD
BOND, T-12
One Hartford Plaza
Hartford, Connecticut 06155
Bond.Claims@thehartford.com
call: 888-266-3488 *or fax:* 860-757-5835

KNOW ALL PERSONS BY THESE PRESENTS THAT:

Agency Name: MHBT INC
Agency Code: 46-461496

- [X] **Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [X] **Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [X] **Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- [ ] **Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of the Southeast**, a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut, (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, ***up to the amount of*** Unlimited :

Edward R. Bowles, Sharon Clary, Dawn Davis, Walter J. DeLaRosa, DONNIE DOAN, TOM P. ELLIS, JOHN FULKERSON, Kristi Meek, Kae Perdue of DALLAS, Texas

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by ☒, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments in the nature thereof, on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

In Witness Whereof, and as authorized by a Resolution of the Board of Directors of the Companies on May 6, 2015 the Companies have caused these presents to be signed by its Senior Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.

John Gray, Assistant Secretary

M. Ross Fisher, Senior Vice President

STATE OF CONNECTICUT }
COUNTY OF HARTFORD } ss. Hartford

On this 11th day of January, 2016, before me personally came M. Ross Fisher, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Senior Vice President of the Companies, the corporations described in and which executed the above instrument; that he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that he signed his name thereto by like authority.

Nora M. Stranko
Notary Public
My Commission Expires March 31, 2018

CERTIFICATE

I, the undersigned, Assistant Vice President of the Companies, DO HEREBY CERTIFY that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is still in full force effective as of 08/08/2017

Signed and sealed at the City of Hartford.

Kevin Heckman, Assistant Vice President

SECTION G
CONTRACT

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

W I T N E S S E T H:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Two-Hundred and Seventy Four (274)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

SECTION H
NOTICE OF AWARD AND NOTICE TO PROCEED

NOTICE OF AWARD

DATED:_____ , 2017

TO: .

ADDRESS:

PROJECT OWNER: JEFFERSON COUNTY

FAA AIP GRANT No. 3-48-0018-034-2017

CONTRACT FOR: TAXIWAY D RECONSTRUCTION (2017) TAXIWAY F TO JERRY WARE APRON

CONSTRUCTION OF: JACK BROOKS REGIONAL AIRPORT

****

You are notified that your Bid dated XXX, 2017 for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for Base Bid with Additive Alternate No. X .

The Contract Price of your contract is_____ dollars and no /100 ($XXXXXX).

You must comply with the following conditions precedent within FIFTEEN (15) days of the date of this *Notice of Award* that is by, XXXXX, 2017

1. You must deliver to the **OWNER 4** fully executed counterparts of the Agreement including all the Contract Documents.

2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Advertisement for Bids, General Conditions (Article 2), and Supplementary Conditions.

3. You must deliver to the **OWNER 4** original ***Certificates of Insurance,*** naming the Owner ***(Jefferson County)*** and Engineer ***(Garver, LLC.)*** and their respective agents and employees, to be expressly named as additional insured's, in accordance with the General Conditions.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid in default, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within ten (10) days after you comply with the above conditions, OWNER will return to you one (1) fully signed counterpart of the Agreement with the Contract Documents attached.

Sincerely,
GARVER, LLC

Thomas D Dodson, PE
Senior Project Manager

ACCEPTANCE OF AWARD:
CONTRACTOR:

_____
BY:_____
TITLE:_____
DATE:_____

XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 274 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXXX, 2017.

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Thomas D Dodson, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

SECTION I
PERFORMANCE AND PAYMENT BONDS
CERTIFICATE OF INSURANCE

PAYMENT BOND

PERFORMANCE BOND

INSERT INSURANCE DOCUMENTS HERE

SECTION J
GENERAL PROVISIONS
(FAA AC 150/5370-10G)

GENERAL PROVISIONS

SECTION 10
DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-1 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-2 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-3 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-4 AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-5 AIR OPERATIONS AREA (AOA). For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-6 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

10-7 ASTM INTERNATIONAL (ASTM). Formerly known as the American Society for Testing and Materials (ASTM).

10-8 AWARD. The Owner's notice to the successful bidder of the acceptance of the submitted bid.

10-9 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 CALENDAR DAY. Every day shown on the calendar.

10-12 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.

10-13 CONTRACT. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

10-14 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-15 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 CONTRACTOR'S LABORATORY. The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

10-18 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-19 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-20 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.

10-21 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-22 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-23 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

10-24 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-25 FORCE ACCOUNT. Force account work is planning, engineering, or construction work done by the Sponsor's employees.

10-26 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections, observations and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-27 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or

cited standard that may be pertinent to such specific reference.

10-28 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as "Engineer's Laboratory" or "quality assurance laboratory."

10-29 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-30 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-31 MATERIALS. Any substance specified for use in the construction of the contract work.

10-32 NOTICE TO PROCEED (NTP). A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-33 OWNER. The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only.

10-34 PASSENGER FACILITY CHARGE (PFC). Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls."

10-35 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 PAYMENT BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-37 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-38 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-39 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-40 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-41 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

10-42 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-43 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-44 SPONSOR. A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-45 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-46 SUBGRADE. The soil that forms the pavement foundation.

10-47 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-49 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-50 TAXIWAY. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

10-51 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-52 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10

SECTION 20
PROPOSAL REQUIREMENTS AND CONDITIONS

20-1 ADVERTISEMENT (NOTICE TO BIDDERS). *(See Page A-2)*

20-2 QUALIFICATION OF BIDDERS. Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year.

Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.
Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

20-3 CONTENTS OF PROPOSAL FORMS. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-4 ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-5 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the

quantities may be increased or decreased as hereinafter provided in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

20-6 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications. **Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.**

20-7 PREPARATION OF PROPOSAL. The bidder shall submit his or her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. If so requested, the bidder shall state the price (written in ink or typed) both in words and numerals for which they propose to do for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign the proposal correctly and in ink. If the proposal is made by an individual, his or her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his or her authority to do so and that the signature is binding upon the firm or corporation.

20-8 RESPONSIVE AND RESPONSIBLE BIDDER. A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-9 IRREGULAR PROPOSALS. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 BID GUARANTEE. Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

20-11 DELIVERY OF PROPOSAL. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 WITHDRAWAL OR REVISION OF PROPOSALS. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by fax or email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 PUBLIC OPENING OF PROPOSALS. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 DISQUALIFICATION OF BIDDERS. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20

SECTION 30
AWARD AND EXECUTION OF CONTRACT

30-1 CONSIDERATION OF PROPOSALS. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-2 AWARD OF CONTRACT. The award of a contract, if it is to be awarded, shall be made within *the amount specified in the advertisement and proposal in* calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

30-3 CANCELLATION OF AWARD. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

30-4 RETURN OF PROPOSAL GUARANTY. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

30-5 REQUIREMENTS OF CONTRACT BONDS. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-6 EXECUTION OF CONTRACT. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section, within calendar days from the date mailed or otherwise delivered to the successful bidder.

30-7 APPROVAL OF CONTRACT. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-8 FAILURE TO EXECUTE CONTRACT. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

END OF SECTION 30

SECTION 40
SCOPE OF WORK

40-1 INTENT OF CONTRACT. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-2 ALTERATION OF WORK AND QUANTITIES. The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

40-3 OMITTED ITEMS. The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item.

Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-4 EXTRA WORK. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work". Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-5 MAINTENANCE OF TRAFFIC. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration.

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire- rescue equipment, or maintenance vehicles at the airport.

c. When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-6 REMOVAL OF EXISTING STRUCTURES. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-7 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, the Contractor may at his or her option either:

a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the Engineer; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-8 FINAL CLEANUP. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property Owner.

END OF SECTION 40

SECTION 50
CONTROL OF WORK

50-1 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

50-2 CONFORMITY WITH PLANS AND SPECIFICATIONS. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-3 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs);

contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the Engineer for an interpretation and decision, and such decision shall be final.

50-4 COOPERATION OF CONTRACTOR. The Contractor will be supplied with three copies each of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the Engineer and his or her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his or her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

50-5 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his or her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join his or her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-6 CONSTRUCTION LAYOUT AND STAKES. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): **electronic CAD format (.dwg or .dgn).** In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not

concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking

b. Rough Grade slope stakes at 100-foot (30-m) stations

c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

d. Roadways – minimum three (3) per station

Base Course blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot (30-m) stations.

b. Between Lifts at 25-foot (7.5-m) stations for the following section locations:

(1) Runways – each paving lane width
(2) Taxiways – each paving lane width
(3) Holding areas – each paving lane width

c. After finish paving operations at 50-foot (15-m) stations:

(1) All paved areas – Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.

e. Fence lines at 100-foot (30-m) stations minimum.

f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach

Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.

g. Drain lines, cut stakes and alignment on 25-foot (7.5-m) stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).

i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet (120 m) per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

50-7 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-8 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors are authorized to notify the Contractor or his or her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for a decision.

50-9 INSPECTION OF THE WORK. All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform

to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection 70-14 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been established by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as established by the Engineer, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.
In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

50-14 PARTIAL ACCEPTANCE. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer may

accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 FINAL ACCEPTANCE. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60
CONTROL OF MATERIALS

60-1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection: **see construction drawings.**

60-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS. Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-3 CERTIFICATION OF COMPLIANCE. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, the Contractor shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-4 PLANT INSPECTION. The Engineer or his or her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-5 ENGINEER'S FIELD OFFICE. The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be

separate from any building used by the Contractor. The Contractor shall furnish photocopy machine, water, sanitary facilities, heat, air conditioning, wireless internet access and electricity The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable to the Engineer to inspect the workmanship and materials used into the work.

60-6 STORAGE OF MATERIALS. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property Owner's permission.
All storage sites on private or airport property shall be restored to their original condition by the Contractor at his or her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-7 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

60-8 OWNER FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-2 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-3 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-4 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated as follows:

Owner	*Person to Contact (Phone Number)*
Jefferson County (Jack Brooks Regional Airport	*Duke Youmans (409) 719-4900*
Federal Aviation Administration	*James Terrel*

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-5 FEDERAL AID PARTICIPATION. For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-6 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

70-7 PUBLIC CONVENIENCE AND SAFETY. The Contractor shall control his or her operations and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches high. Unless otherwise specified, barricades shall be spaced not more than 4 feet apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor's parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-9 USE OF EXPLOSIVES. When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to

complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below:

- Contractor shall reference the Construction Safety and Phasing Plan for phasing/beneficial occupancy requirements.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2 (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his or her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS. As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the

Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are indicated as follows:

- Contractor shall reference section 70-04 of the General Provisions for utility location information.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70- 04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his or her surety.

70-15.1 FAA FACILITIES AND CABLE RUNS. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport manager a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 NO WAIVER OF LEGAL RIGHTS. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 ENVIRONMENTAL PROTECTION. The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the

Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

SECTION 80
EXECUTION AND PROGRESS

80-1 SUBLETTING OF CONTRACT. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least **25** percent of the total contract cost.

Should the Contractor elect to assign his or her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

80-2 NOTICE TO PROCEED. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-3 EXECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-4 LIMITATION OF OPERATIONS. The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

- The contractor shall reference the Construction Safety and Phasing Plans for all phases of the work.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction (see Special Provisions).

80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION. All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

80-5 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition

that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-6 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his or her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-7 DETERMINATION AND EXTENSION OF CONTRACT TIME. The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

b. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal.

Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period, *as detailed in the Special Provisions*. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-8 FAILURE TO COMPLETE ON TIME. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted

sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
See Proposal and Contract		

The maximum construction time allowed for Schedules **[N/A]** will be the sum of the time allowed for individual schedules but not more than **[N/A]** days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-9 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his or her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason above, the Engineer shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be

liable and shall pay to the Owner the amount of such excess.

80-10 TERMINATION FOR NATIONAL EMERGENCIES. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his or her responsibilities for the completed work nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS. The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of **400** feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within **250** feet of an active runway at any time.

END OF SECTION 80

SECTION 90
MEASUREMENT AND PAYMENT

90-1 MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions. Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 lb (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-2 SCOPE OF PAYMENT. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-3 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-4 PAYMENT FOR OMITTED ITEMS. As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-5 PAYMENT FOR EXTRA WORK. Extra work, performed in accordance with the subsection 40-04 titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-6 PARTIAL PAYMENTS. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

When at least 95% of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-7 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-8 PAYMENT OF WITHHELD FUNDS. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-9 ACCEPTANCE AND FINAL PAYMENT. When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, and after the Engineer's receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances.

Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 CONSTRUCTION WARRANTY.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or
(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within 7 days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 30 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 PROJECT CLOSEOUT. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual.

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90

SECTION 100
CONTRACTOR QUALITY CONTROL PROGRAM

100-1 GENERAL. When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

a. Adequately provide for the production of acceptable quality materials.

b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.

c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

Paving projects over $250,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner's representative and the FAA prior to or at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

100-2 DESCRIPTION OF PROGRAM.

a. General description. The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. QUALITY CONTROL PROGRAM. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least **10** calendar days before the **associated work begins.** The Contractor's Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

a. Quality control organization

b. Project progress schedule

c. Submittals schedule

d. Inspection requirements

e. Quality control testing plan

f. Documentation of quality control activities

g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

100-3 QUALITY CONTROL ORGANIZATION. The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Program Administrator shall be a full-time on-site employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).

(5) Highway materials technician certified at Level III by NICET.

(6) Highway construction technician certified at Level III by NICET.

(7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. Quality control technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.

(2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.

(3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

100-4 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

100-5 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 INSPECTION REQUIREMENTS. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-7 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (for example, P-401)

b. Item description (for example, Plant Mix Bituminous Pavements)

c. Test type (for example, gradation, grade, asphalt content)

d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (for example, plant technician)

g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

100-8 DOCUMENTATION. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description
(2) Compliance with approved submittals
(3) Proper storage of materials and equipment
(4) Proper operation of all equipment
(5) Adherence to plans and technical specifications
(6) Review of quality control tests
(7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-9 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action

shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

100-11 NONCOMPLIANCE.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

(1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

END OF SECTION 100

SECTION 105 MOBILIZATION

105-1 DESCRIPTION. This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 POSTED NOTICES. Prior to commencement of construction activities the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-2 BASIS OF MEASUREMENT AND PAYMENT. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

END OF SECTION 105

SECTION 110
METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-1 GENERAL. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, QL for Lower Quality Index and/or QU for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot values within the lot by using the following formula:

$$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$$

Where: X = Sample average of all sublot values within a lot
x_1, x_2 = Individual sublot values
n = Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2) / (n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot values in the set
d_1, d_2 = Deviations of the individual sublot values x_1, x_2,.. from the average value X that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$
n = Number of sublots

f. For single sided specification limits (that is, L only), compute the Lower Quality Index QL by use of

the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with QL, using the column appropriate to the total number (n) of measurements. If the value of QL falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (that is, L and U), compute the Quality Indexes QL and QU by use of the following formulas:

$$Q_L = (X - L) / S_n$$

And

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit
P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project
Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

   A-1 = 96.60
   A-2 = 97.55
   A-3 = 99.30
   A-4 = 98.35
   n = 4

2. Calculate average density for the lot.

   $X = (x_1 + x_2 + x_3 + \ldots x_n) / n$
   $X = (96.60 + 97.55 + 99.30 + 98.35) / 4$
   X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)2)) / (4 - 1)]^{1/2}$
$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$
$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

   $Q_L = (X - L) / S_n$
   $Q_L = (97.95 - 96.30) / 1.15$
   $Q_L = 1.4348$

5. Determine PWL by entering Table 1 with QL= 1.44 and n= 4.

   PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

   A-1 = 5.00
   A-2 = 3.74
   A-3 = 2.30
   A-4 = 3.25

2. Calculate the average air voids for the lot.

   $X = (x_1 + x_2 + x_3 \ldots x_n) / n$
   $X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
   $X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

   $S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$
   $S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$
   $S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

   $Q_L = (X - L) / S_n$
   $Q_L = (3.57 - 2.00) / 1.12$
   $Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and n = 4.

   PL = 97

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

   $Q_U = (U - X) / S_n$
   $Q_U = (5.00 - 3.57) / 1.12$
   $Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

   $P_U = 93$

8. Calculate Air Voids PWL

PWL = (P_L + P_U) - 100
PWL = (97 + 93) - 100 = 90

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project
Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

   A-3 = 99.30
   A-4 = 98.35
   A-2 = 97.55
   A-1 = 96.60

2. Use n=4 and upper 5% significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

   a. For measurements greater than the average:

      If (measurement - average) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier

      For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

      Since 1.174 is less than 1.463, the value is not an outlier.

   b. For measurements less than the average:

      If (average - measurement) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier.

      For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

      Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

Less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420

96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566

43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

END OF SECTION 110

SECTION K
SPECIAL PROVISIONS

SPECIAL PROVISIONS

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SECTION A – FEDERAL AVIATION ADMINISTRATION REQUIREMENTS

A-01 GENERAL CIVIL RIGHTS PROVISIONS

The contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

This provision also obligates the tenant/concessionaire/lessee or its transferee for the period during which Federal assistance is extended to the airport through the Airport Improvement Program, except where Federal assistance is to provide, or is in the form of personal property; real property or interest therein; structures or improvements thereon.

In these cases the provision obligates the party or any transferee for the longer of the following periods:

(a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits; or
(b) the period during which the airport sponsor or any transferee retains ownership or possession of the property.

A-02 CIVIL RIGHTS – TITLE VI ASSURANCES

Title VI Solicitation Notice:
The Owner, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the **Title VI List of Pertinent Nondiscrimination Statutes and Authorities**, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

   a. Withholding payments to the contractor under the contract until the contractor complies; and/or

   b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

A-03 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   A. Timetables

   B. Goals for minority participation for each trade (Vol. 45 Federal Register pg. 65984 10/3/80)

   C. Goals for female participation in each trade (6.9%)

These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor is also subject to the goals for both federally funded and non-federally funded construction regardless of the percentage of federal participation in funding.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities

and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is the Jefferson County, Texas.

A-04 ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A-05 BUY AMERICAN CERTIFICATION

See Section 010470 "Bidder Certifications" for Contractor Buy American Certification.

A-06 DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

Prompt Payment (§26.29))- The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from Owner. The prime contractor agrees further to return retainage payments to each subcontractor within {specify the same number as above} days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

A-07 ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

A-08 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance

to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Federal Fair Labor Standards Act (29 USC 201)	U.S. Department of Labor – Wage and Hour Division

A-09 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder or offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A-10 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Occupational Safety and Health Act of 1970 (20 CFR Part 1910)	U.S. Department of Labor – Occupational Safety and Health Administration

A-11 RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this contract are subject to requirements and regulations issued by the FAA and the Sponsor of the Federal grant under which this contract is executed.

A-12 TRADE RESTRICTION CLAUSE

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;

c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001

A-13 VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference must be given to Vietnam era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns owned and controlled by disabled veterans as defined in Title 49 United States

Code, Section 47112. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

A-14 COPELAND "ANTI-KICKBACK" ACT

The United States Department of Labor Wage and Hours Division oversees the Copeland "Anti-Kickback" Act requirements. All contracts and subcontracts must meet comply with the Occupational Safety and Health Act of 1970.

United States Department of Labor Wage and Hours Division can provide information regarding any specific clauses or assurances pertaining to the Copeland "Anti-Kickback" Act requirements required to be inserted in solicitations, contracts or subcontracts.

A-15 DAVIS-BACON LABOR PROVISIONS

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent

by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2 Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the

contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;
(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or

indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize

apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts.

The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

A-16 TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the Contractor must promote policies and initiatives for employees and other work personnel that decrease crashes by distracted drivers, including policies to ban text messaging while driving. The Contractor must include these policies in each third party subcontract involved on this project.

A-17 EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and

applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the

administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 18.7a through 18.7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract

Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the

company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such a superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (18.7a through 18.7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 18.7a through 18.7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith

effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 18.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A-18 NOTICE OF NONSEGREGATED FACILITIES REQUIREMENT

Notice to Prospective Federally Assisted Construction Contractors:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the

forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

A-19 TERMINATION OF CONTRACT

a. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services must be immediately discounted (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.

b. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price will be made, but no amount will be allowed for anticipated profit on unperformed services.

c. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor is liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.

d. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination will be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price will be made as provided in paragraph 2 of this clause.

e. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

A-20 CERTIFICATE REGARDING DEBARMENT AND SUSPENSION

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

CERTIFICATION REGARDING DEBARMENT AND SUSPENSION (SUCCESSFUL BIDDER REGARDING LOWER TIER PARTICIPANTS)

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov

2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.

3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

A-21 BREACH OF CONTRACT

Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

A-22 CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

2. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued thereunder;

3. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;

4. To include or cause to be included in any construction contract or subcontract which exceeds $100,000 the aforementioned criteria and requirements.

A-23 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2 .Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 above, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 above.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 above.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION B – STATE TERMS AND CONDITIONS

B-01 NOT USED

SECTION C – LOCAL TERMS AND CONDITIONS

C-01 CONTRACTOR'S INSURANCE

Contractor shall obtain insurance of the types and in the amounts described below. The insurance shall be written by insurance companies and on forms acceptable to Owner.

Owner and Garver, LLC shall be included as an insured under the CGL, (using ISO Additional Insured Endorsement CG 20 10 11 85 or a substitute providing equivalent coverage), and under the commercial automobile liability (using ISO Additional Insured Endorsement CA 2048 or a substitute providing equivalent coverage), and commercial umbrella, if any. This insurance, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Commercial General and Umbrella Liability Insurance: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than $5,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to the Project.

CGL insurance shall be written on ISO occurrence form CG 20 10 (11-85) (or a substitute combination of the following forms CG 20 10 (10-01) and CG 20 37 (10-01) providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury and liability assumed under an insured contract.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or amending the contractual coverage in the ISO occurrence form.

CGL insurance shall be written with an ISO form CG 25 03 05 09 Designated Construction Project(s) General Aggregate Limit or a substitute form providing equivalent coverage.

Continuing CGL Coverage: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance, with a limit of not less than $5,000,000 each occurrence for at least 3 years following substantial completion of the Work.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed Work equivalent to that provided under ISO form CG 00 01.

Owner's and Contractor's Protective Liability Insurance: Contractor shall maintain Owner's and Contractor's Protective Liability (OCP) insurance on behalf of Owner and Garver, LLC, as named insured, with a limit of $1,000,000.

Railroad Protective Liability Insurance: Not applicable.

Commercial Auto and Umbrella Liability Insurance: Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than $1,000,000 each accident.

Such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos).

Commercial auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

If the Contract Documents require Contractor to remove and haul hazardous waste from the Project site, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under the ISO Pollution Liability-Broadened Coverage for Covered Autos Endorsement (CA 99 48) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

Workers' Compensation Insurance: Contractor shall maintain workers' compensation and employer's liability insurance.

1 Definitions:

1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Contractor's Insurance requirements above.

4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 1. – 7. with the certificates of coverage to be provided to the person for whom they are providing services.

10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

The employer's liability, and if necessary commercial umbrella, limits shall not be less than $500,000 each accident for bodily injury by accident or $500,000 each employee for bodily injury by disease.

If Contractor leases its employees, the alternate employer endorsement (WC 00 03 01 A) shall be attached showing Owner in the schedule as the alternate employer.

Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy.

Where applicable, Nonappropriated Fund Instrumentalities Act (NFIA) shall be attached to the policy. NFIA extends the coverage of the Longshore and Harbor Workers' Compensation Act to civilian employees working on United States military bases throughout the world who are not paid with funds appropriated by Congress. These employees, working in facilities operated for the comfort, contentment, and improvement of armed forces personnel, are instead compensated with funds generated from earnings of their facility.

Where applicable, Outer Continental Shelf Lands Act Endorsement shall be attached to the policy.

Where applicable, the Maritime Coverage Endorsement shall be attached to the policy.

If project is located in a state where workers compensation is secured via monopolistic state funds, include evidence of the "Stop Gap" endorsement to the general liability policy.

Property Insurance: If applicable, Contractor shall purchase and maintain property insurance for the Work. Such insurance shall be written in an amount at least equal to the initial contract sum as well as subsequent modifications of that sum. The insurance shall apply on a replacement cost basis. If the insurance obtained in compliance with this paragraph is builders risk insurance, coverage shall be written on a completed value form.

The property insurance as required above shall name as insureds the Owner, Contractor, and all subcontractors and sub-subcontractors on the Project.

Primary and Non-contributory: Contractor agrees that the insurance listed above, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Waiver of Subrogation: Contractor waives all rights against the Owner and Garver, LLC and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability, commercial umbrella liability insurance, automobile liability insurance and workers compensation insurance maintained pursuant to paragraph C-01 of this agreement.

No Implied Waiver: Contractor shall furnish certifications matching the coverage requirements. Failure of Owner or Engineer to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner or Engineer to identify a deficiency from evidence that is provided shall not be construed as a waiver of the contractors obligations to furnish and maintain such insurance, or as a waiver to the enforcement of any of the provisions at a later date.

Any waiver of the contractor's obligation to furnish such certificate or maintain such evidence must be by written change order and signed by a Managing Member (Officer) of the Engineer and the Owner.

Cancellation, Non-Renewal, and/or Impairment Notification: The Contractor shall not cause any insurance policy to be cancelled or permit it to lapse and all insurance policies shall include an endorsement to the effect that the insurance policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance until notice has been mailed to the Owner and Engineer, stating the date when such cancellation or reduction shall be effective, which

date shall not be less than (60) days after such notice.

The amount shown in the bid item for the Owner's Protective Insurance shall include that amount of additional premium required for obtaining Owner's and Engineer's Protective Liability insurance for the Owner and Garver, LLC. The Engineer has the right to request justification from the contractor for the full amount of the cost included under the items "Owner's Protective Insurance".

Notice shall be sent via email and regular mail to the following persons and addresses:

Owner:
Alex Rupp
5000 Jerry Ware Drive
Beaumont, TX 77705
ARupp@co.Jefferson.tx.us

Garver:
Thomas Dodson, PE
Garver, LLC
12141 Wickchester
Suite 640
Houston, TX 77079
TDDodson@GarverUSA.com

C-02 UTILITIES

All work in this contract shall be in accordance with the Texas Underground Facilities Damage Prevention Act. The Contractor shall abide by the most current edition of this Act.

Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown.

The Contractor shall be responsible for the protection of all existing utilities or improvements crossed by or adjacent to his construction operations. Where existing utilities or service lines are cut, broken, or damaged, the Contractor shall replace or repair immediately the utilities or service lines with the same type of original material and construction or better, at his own expense.

C-03 LEGAL HOLIDAYS

Holidays that shall be observed are the following: New Year's Day (January 1); Memorial Day (last Monday in May); Independence Day (July 4); Labor Day (1st Monday in September); Thanksgiving Day (4th Thursday in November); and Christmas Day (December 25); no other days will be so considered. If a holiday falls on a Saturday or Sunday, the observed day shall be the Friday preceding the Saturday or the Monday following the Sunday. No construction observation will be furnished on legal holidays or Sundays, except in an emergency. The Contractor shall observe these legal holidays and all Sundays, and no work shall be performed on these days except in an emergency. Calendar day contract time includes delays for all holidays. Refer to Section C-06 for more information.

C-04 CLEAN UP

From time to time, the Contractor shall clean up the site, including any work areas at the airport, in order that the site presents a neat appearance and the progress of the work not be impeded. One such period of clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary plant, equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

C-05 PROJECT MEETINGS AND COORDINATION

A preconstruction conference will be called by the Engineer at a time convenient to the Owner and before the issuance of the "Notice to Proceed". The Engineer and the Contractor and such subcontractors as the Contractor may desire shall attend this meeting with the Owner.

The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this Contract. The Contractor shall attend all such conferences. This in no way relieves the Contractor of his responsibility to fully coordinate his work under this Contract.

C-06 LIQUIDATED DAMAGES FOR DELAY

The number of calendar days allowed for completion of the project is stipulated in the Proposal and in the Contract and shall be known as the Contract Time. The Contractor agrees that time is a critical element for this Contract. Loss will accrue to the Owner due to delayed completion of the work; and the cost to the Owner of the administration of the Contract, including engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The Contractor agrees that for each day of delay beyond the number of calendar days herein agreed upon for the completion of the work herein specified and contracted for, the Owner may withhold, permanently, from the Contractor's total compensation, the sum of **One**

Thousand Dollars ($1,000.00) as stipulated damages for each day of such delay. Should the amount otherwise due the Contractor be less than the amount of such ascertained and liquidated damages, the Contractor and his Surety shall be liable to the Owner for such deficiency.

It is understood and agreed by and between the Owner and the Contractor that the time of completion herein set out is a reasonable time. The Contractor shall perform fully, entirely, and in an acceptable manner, the work contracted for within the contract time stated in the Contract. The contract time shall be counted from ten days after the effective date of the "Notice to Proceed", or the date work commences, whichever occurs first; and shall include all Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of any orders of the Engineer for suspension of the prosecution of the work, due to the fault of the Contractor, shall be counted as elapsed contract time, and shall not be considered for an extension of time.

Extensions of time for completion, under the condition of 3(a) next below, will be granted; extensions may be granted under other stated conditions:

1. If the satisfactory execution and completion of the Contract shall require work or material in greater amounts or quantities than those set forth in the Contract, then the Contract time shall be increased in the same proportion as the additional work bears to the original work contracted for.

2. An average or usual number of inclement weather days, when work cannot proceed, is to be anticipated during the construction period and is not to be considered as warranting extension of time. The days included in the contract time for Normal Weather-Related Events and holidays are as follows:

(On A Monthly Basis)

Month	Normal Weather-Related Events
January	5
February	7
March	4
April	4
May	3
June	4
July	8
August	4
September	6
October	5
November	2
December	5

If, however, it appears that the Contractor is delayed by conditions of weather, outside of normal weather-related events detailed in the proceeding table, extensions of time may be granted.

3. Should the work under the Contract be delayed by other causes which could not have been prevented or contemplated by the Contractor, and which are beyond the Contractor's power to prevent or remedy, an extension of time may be granted. Such causes of delay shall include but not necessarily be limited to the following:

   a. Acts of God, acts of the public enemy, acts of the Owner except as provided in these Specifications, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather.

b. Any delays of Subcontractors or suppliers occasioned by any of the causes specified above.

The Engineer or other authorized representative of the Owner shall keep a written record sufficient for determination as to the inclusion of that day in the computation of Contract time. This record shall be available for examination by the Contractor during normal hours of work as soon as feasible after the first of each construction month. In case of disagreement between the representative of the Owner and the Contractor, as to the classification of any day, the matter shall be referred to the Owner whose decision shall be final.

If the Contractor finds it impossible for reasons beyond his control to complete the work within the Contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the Contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may recommend to the Owner that the contract time be extended as conditions justify. If the Owner extends the contract, the extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

The amount of all extensions of time for whatever reason granted shall be determined by the Owner. In general, only actual and not hypothetical days of delay will be considered. The Owner shall have authority to grant additional extensions of time as the Owner may deem justifiable.

C-07 QUALITY ASSURANCE/MATERIALS TESTING

The Owner shall be responsible for quality assurance testing as stated in theses specifications; however, the Contractor shall be responsible for payment of any subsequent tests made necessary by previous unsatisfactory tests. In this event, the Owner's quality assurance representative shall conduct the additional testing and payment for such tests shall be directly deducted from the Contractor's payment. The Contractor shall pay for additional testing at the Owner's contract rate.

C-08 RECORD DOCUMENTS

The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, Shop Drawings and samples at the site, in good order, and annotated to show all changes made during the construction process. In addition, the Contractor shall note any differences between locations of underground existing facilities shown in the plans and the actual location located during construction. These record documents shall be available to the Engineer for examination and shall be delivered to the Engineer upon completion of the work.

C-09 CONTRACTOR/SUBCONTRACTOR/SUPPLIER LEGAL DISPUTES

Any fees, expenses, charges, fines or other costs borne by the Owner as a result of legal disputes or lawsuits between the contractor and his subcontractors, or between the contractor and his suppliers, shall be deducted from monies due or which may thereafter become due the contractor.

C-10 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements embraced in this contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of final acceptance of the work. The Contractor will be responsible for all costs associated with construction observation and oversight for the repair work. The Owner will give notice of defective materials and work with reasonable promptness. In the event repair work is required, the

Contractor shall remedy any defects and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of the acceptance of the repair work.

C-11 CONTRACTOR'S RELEASE AND AFFIDAVIT

At the project's completion, the Contractor shall execute the attached Release and Lien Waiver to release all claims against the Owner arising under and by virtue of his Contract. The date of the Release shall be that agreed to for the final acceptance of the project with the Owner.

C-12 SUBMITTALS

The Contractor shall prepare and submit information required by the individual Specification sections sufficiently in advance of the related work to allow an appropriate review time by the Engineer. The types of submittals are indicated in the individual Specification sections.

During the preconstruction conference, the Contractor shall review his submittal schedule and procedures, including notifying the Engineer whether electronic submittals or paper submittals will be provided for all submittal packages in the project. Mixing of package types will not be allowed. The Contractor shall provide one of the following submittal package types:

1. Submit electronic submittals via email as PDF electronic files directly to the Engineer's designated representative, or post these PDF electronic files directly to the Engineer's FTP site specifically established for this project. Electronic submittals shall be in Adobe Acrobat (*.PDF) format and shall be legible when printed.

2. Submit six (6) paper submittal copies via mail or other courier service to the Engineer's designated representative.

Submittals shall be neat, organized, and easy to interpret. Assemble complete submittal package into a single indexed electronic file or hard cover bound book, incorporating submittal requirements of an individual Specification section, the transmittal form with unique submittal numbering system, and electronic links or tabs enabling navigation to each item. Unless approved otherwise by the Engineer, all submittals for the individual Specification section shall be submitted at one time.

Submittals must come directly from the Prime Contractor; submittals from subcontractors or suppliers will not be reviewed.

Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Faxed submittals or submittals with extremely small or otherwise unreadable print will not be accepted. Submittals not required by the Contract Documents will be returned by the Engineer without action.

The Contractor shall retain complete copies of submittals on project site. Use only final submittals that are marked with approval notation from Engineer's submittal review stamp with comments form.

Resubmittals shall continue the unique, sequential, submittal numbering system. Resubmittals without unique numbering, example resubmittals transmitted as 005A or 005REV, are unacceptable and will be returned un-reviewed.

C-13 STORMWATER POLLUTION PREVENTION PLAN

Refer to Technical Specification P-156.

C-14 TEST BORINGS/SUBSURFACE INFORMATION

A geotechnical investigation and soils report have been completed for the project area and are available upon request. This information can be obtained by contacting the Engineer.

Soil characteristics provided in any soil reports, or as shown on boring logs, are representative only at the location of the sample taken, and neither the Owner, Engineer nor Engineer's consultants will be responsible for variations in the soil characteristics at other locations. Any subsurface information or geotechnical reports made available to Contractor was obtained and intended for the Owner's design and estimating purposes only. Such reports and drawings are not Contract Documents.

The Contractor may not rely upon or make any claim against Owner, Engineer, or Engineer's Consultants with respect to (1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor and safety precautions and programs incident thereto, (2) other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings, or (3) any Contractor interpretation or other conclusion drawn from any data, interpretations, opinions, or information.

If in any case, the recommendations set forth in the Geotechnical Report conflict with the requirements set forth in these Contract Documents, the requirements in the Contract Documents shall take precedent.

C-15 WAGE RATES

The Davis Bacon minimum wage rates for this project are applicable and included in Section L of this contract.

END OF SPECIAL PROVISIONS

RELEASE OF LIEN

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

DATE OF CONTRACT: _____

Upon receipt of the final payment and in consideration of that amount, the undersigned does hereby release the Owner and its agents from any and all claims arising under or by virtue of this Contract or modification thereof occurring from the undersigned's performance in connection with the

_____

_____

project.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

CONTRACTOR'S AFFIDAVIT

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

_____

DATE OF CONTRACT: _____

I hereby certify that all claims for material, labor, and supplies entered into contingent and incident to the construction or used in the course of the performance of the work on _____

_____

have been fully satisfied.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

The Surety Company consents to the release of the retained percentage on this project with the understanding that should any unforeseen contingencies arise having a right of action on the bond that the Surety Company will not waive liability through the consent to the release of the retained percentage.

Dated _____
Surety Company

By _____
Resident Agent, State of Texas

SECTION L
ADDENDA

INSERT ADDENDA HERE

SECTION M
WAGE RATES

Article 5159a of the Revised Civil Statutes of Texas, passed by the 43rd Legislature Acts of 1933, Page 91, Chapter 45, provides that any government subdivision shall ascertain the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft or type of workman or mechanic and shall specify in the call for bids and in the Contract the prevailing rate of per diem wages which shall be paid for each craft type of workman. This Article further provides that the CONTRACTOR shall forfeit, as a penalty, to the City, County, or State, or other political subdivision, Ten Dollars ($10.00) per day for each laborer, or workman, or mechanic who is not paid the stipulated wage for the type of work performed by him as set up on the wage scale. The OWNER is authorized to withhold from the CONTRACTOR, after full investigation by the awarding body, the amount of this penalty in any payment that might be claimed by the CONTRACTOR or Subcontractor. The Act makes the CONTRACTOR responsible for the acts of the Subcontractor in this respect.

The Article likewise requires that the CONTRACTOR and Subcontractor keep an accurate record of the names and occupations of all persons employed by him and show the actual per diem wages paid to each worker, and these records are open to the inspection of the OWNER.

The Davis Bacon minimum wage rates for this project are as follows:

LABOR CLASSIFICATION AND MINIMUM WAGE SCALE

General Decision Number: TX170056 01/06/2017 TX56

Superseded General Decision Number: TX20160056

State: Texas

Construction Type: Highway

Counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, San Jacinto and Waller Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction;bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

* SUTX2011-013 08/10/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures)	$ 12.98	
ELECTRICIAN	$ 27.11	
FORM BUILDER/ FORM SETTER		
Paving & Curb	$ 12.34	
Structures	$ 12.23	
LABORER		
Asphalt Raker	$ 12.36	
Flagger	$ 10.33	
Laborer, Common	$ 11.02	
Laborer, Utility	$ 11.73	
Pipelayer	$ 12.12	
Work Zone Barricade Servicer	$ 11.67	
PAINTER (Structures)	$ 18.62	
POWER EQUIPMENT OPERATOR		
Asphalt Distributor	$ 14.06	
Asphalt Paving Machine	$ 14.32	
Broom or Sweeper	$ 12.68	
Concrete Pavement Finishing Machine	$ 13.07	
Concrete Paving, Curing, Float, Texturing Machine	$ 11.71	
Concrete Saw	$ 13.99	
Crane, Hydraulic 80 Tons or less	$ 13.86	
Crane, Lattice boom 80 tons or less	$ 14.97	
Crane, Lattice boom over 80 Tons	$ 15.80	
Crawler Tractor	$ 13.68	
Excavator, 50,000 pounds or less	$ 12.71	
Excavator, Over 50,000 pounds	$ 14.53	
Foundation Drill, Crawler Mounted	$ 17.43	
Foundation Drill, Truck Mounted	$ 15.89	
Front End Loader 3 CY or Less	$ 13.32	
Front End Loader, Over 3 CY	$ 13.17	
Loader/Backhoe	$ 14.29	
Mechanic	$ 16.96	
Milling Machine	$ 13.53	
Motor Grader, Fine Grade	$ 15.69	
Motor Grader, Rough	$ 14.23	
Off Road Hauler	$ 14.60	
Pavement Marking Machine	$ 11.18	
Piledriver	$ 14.95	
Roller, Asphalt	$ 11.95	
Roller, Other	$ 11.57	
Scraper	$ 13.47	
Spreader Box	$ 13.58	
Servicer.	$ 13.97	
Steel Worker		
Reinforcing Steel	$ 15.15	
Structural Steel Welder	$ 12.85	
Structural Steel	$ 14.39	
TRUCK DRIVER		
Low Boy Float	$ 16.03	
Single Axle	$ 11.46	
Single or Tandem Axle Dump	$ 11.48	
Tandem Axle Tractor w/Semi Trailer	$ 12.27	
WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.		

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union

average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- an existing published wage determination
- a survey underlying a wage determination
- a Wage and Hour Division letter setting forth a position on a wage determination matter
- a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

For current Wage Determination Decisions, see the Department of Labor website (http://www.wdol.gov/dba.aspx#0).

SECTION N
CHANGE ORDER FORM

Change Order

No. _____

Date of Issuance: Effective Date:
Project: Owner: Owner's Contract No.:
Contract: Date of Contract:
Contractor: Engineer's Project No.:

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments: (List documents supporting change):

CHANGE IN CONTRACT PRICE:
Original Contract Price:

CHANGE IN CONTRACT TIMES:
Original Contract Times:
Working days Calendar days

Substantial completion (days or date):
$ Ready for final payment (days or date):
[Increase] [Decrease] from previously approved Change

Orders No._____ to No._____:

[Increase] [Decrease] from previously approved Change Orders
No._____ to No._____:

Substantial completion (days):

$ Ready for final payment (days):
Contract Price prior to this Change Order: Contract Times prior to this Change Order:

Substantial completion (days or date):

$ Ready for final payment (days or date):
[Increase] [Decrease] of this Change Order: [Increase] [Decrease] of this Change Order:
Substantial completion (days or date):

$ Ready for final payment (days or date):
Contract Price incorporating this Change Order: Contract Times with all approved Change Orders:

Substantial completion (days or date):
$ Ready for final payment (days or date):

RECOMMENDED:	ACCEPTED:	ACCEPTED:
_____	_____	_____
By: Engineer (Authorized Signature)	By: Owner (Authorized Signature)	By: Contractor (Authorized signature)
_____	_____	_____
Date:	Date:	Date:

_____ _____
Approved by Funding Agency (if applicable): Date:

SECTION O
TECHNICAL SPECIFICATIONS

ITEM SS-100 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP)

DESCRIPTION

100-1.1 This item includes notes in reference to construction safety and phasing for the project. This item shall be used in conjunction with all Construction Safety Drawings and Construction Safety and Phasing Notes in the plans.

CONSTRUCTION SAFETY AND PHASING NOTES

100-2.1 COORDINATION.

a. Contractor Progress Meetings - The Owner, Engineer, and Contractor will hold progress meetings on a coordinated schedule during construction. Operational safety will be a standing agenda item in such meetings.

b. Scope or Schedule Changes - The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this contract and/or scope or schedule changes. The Contractor shall attend all such conferences.

c. –NOT REQUIRED-

100-2.2 PHASING. During performance of this project, the airport's runways, taxiways, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible. The project is phased to reduce operational impacts at the airport.

a. Phase Elements – If necessary for each phase, the construction safety drawings detail the areas closed to aircraft operations, estimated duration of closures, taxi routes, ARFF access routes, construction staging areas, construction access and haul routes, NAVAID impacts, lighting and marking changes, available runway length, declared distances, hazard marking and lighting, and required lead time for NOTAMS.

b. Construction Safety Drawings – See sheets G-301 through G-305 of the construction plans for construction safety drawings.

100-2.3 AREAS OF OPERATIONS AFFECTED BY CONSTRUCTION ACTIVITY.

a. Identification of Affected Areas – See the table below and the construction safety drawings for areas affected by construction for each phase.

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12-30 ARC	C-III	Same	Same	Same
Runway 12 Approach Minimums	½ Mile	Same	Same	Same
Runway 30 Approach Minimums	¾ Mile	Same	Same	Same
Runway 12 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12 Declared Distances	ASDA: 6,675	Same	Same	Same
	LDA: 6,675	Same	Same	Same
Runway 30 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same
	ASDA: 6,750	Same	Same	Same
	LDA: 6,750	Same	Same	Same
Runway 12 Approach Procedures	ILS/RNAV/VOR	Same	Same	Same
Runway 30 Approach Procedures	RNAV/LPV	Same	Same	Same
Runway 12 NAVAIDS	MALSR, DME	Same	Same	Same
Runway 30 NAVAIDS	PAPI	Same	Same	Same
Taxiway D ARC	ADG-III / TDG-V	ADG-III / TDG-III	ADG-III / TDG-III	ADG-III / TDG-III

b. Mitigation Efforts - See the table above and the construction safety drawings for mitigation efforts of operations affected by construction.

100-2.4 PROTECTION OF NAVIGATION AIDS (NAVAIDS). The Contractor must not conduct any construction activity within navigational aid restricted areas without prior approval from the local FAA Airway Facilities Sector representative. Navigational aids include instrument landing system components and very high-frequency omni-directional range airport surveillance radar. Such restricted areas are depicted on the construction safety drawings.

100-2.5 CONTRACTOR ACCESS.

a. Location of Stockpiled Materials - The Contractor may install a temporary fence around his construction staging area to separate his material stockpile, equipment storage, and parking areas from the public. No personal vehicles of contractor's employees will be allowed inside the secured area of the airport. All material deliveries shall be received in the staging area reserved by the contractor. No delivery trucks will be allowed access to a secured area of the airport beyond this staging area. Stockpiled materials and equipment are not permitted within the active runway safety area and obstacle free zone. The contractor shall receive approval from the Engineer and FAA air spacing office prior to locating stockpiles or equipment within the object free area, safety area, or obstacle free zone. No stockpile shall be greater than 15-ft in height.

b. Vehicle and Pedestrian Operations - See the construction safety drawings for construction site parking, equipment storage areas, and access and haul routes. Vehicular traffic shall always yield to aircraft traffic.

When any vehicle, other than one that has prior approval from the airport operator, must travel over any portion of an aircraft movement area, it will be escorted and properly identified. To operate in those areas during daylight hours, the vehicle must have a flag or beacon attached to it. Any vehicle operating on the

movement areas during hours of darkness or reduced visibility must be equipped with a flashing dome-type light, the color of which is in accordance with local or state codes.
All construction vehicles shall be clearly identified for control purposes by prominently displaying the company name on each side of the vehicle. The identification symbols should be a minimum 8-inch block-type characters of a contrasting color and easy to read. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable.

At 14 CFR Part 139 certified and towered airports, all vehicle operators having access to the active parts of the airfield must be familiar with airport procedures for the operation of ground vehicles and the consequences of noncompliance or be escorted by someone who is. Those trained must provide a certificate of training to the airport prior to accessing the airfield. Only those trained and providing a certificate as such will have escorting privileges.

Personnel entering the active parts of the airport must be in possession of and display a valid airport identification badge at all times or must be escorted by a person with the above-noted escorting privileges. Any person who is escorting individuals must be in direct control of the escorted individuals at all times. Any fine, including any and all associated costs, assessed the airport for failure to maintain security of the airport which are a result of the negligence of the prime contractor, any of his subcontractors, or any supply/delivery personnel, will be assessed to the prime contractor and shall be deducted from any monies due him.

Vehicular traffic located in or crossing an active movement area must have a working two-way radio in contact with the control tower or be escorted by a person in radio contact with the tower. The driver, through personal observation, should confirm that no aircraft is approaching the vehicle position. Construction personnel may operate on the airfield without two-way radio communication provided a NOTAM is issued closing the area and the area is properly marked to prevent incursions. Two-way radio communications are required between Contractor personnel and the Airport Traffic Control Tower/Airport Aeronautical Advisory Stations "Beaumont Ground" (119.50MHz) between the hours of 06:00 and 22:00; and UNICOM (122.95MHz) between the hours of 22:00 and 06:00 daily. Continuous monitoring is required only when equipment movement is necessary in certain areas.

c. Control of Gates - The Contractor shall be responsible for maintaining the security of the access gates by keeping the access gate locked or guarded at all times. Should the Contractor fail, at any time, to keep the access gate locked or guarded, there shall be a fine of $200.00 assessed to the Contractor, for each occurrence that the Contractor fails to maintain the security of the access gate. All fines assessed to the Contractor shall be deducted from any monies due to him/her.

100-2.6 WILDLIFE MANAGEMENT. The Contractor shall review AC 150/5200-33, hazardous wildlife attractants on or near airports, and CertAlert 98-05, grasses attractive to hazardous wildlife (www.faa.gov). The Contractor shall carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports. The contractor shall mitigate the following items.

a. Trash - The Contractor shall perform trash clean-up on a daily basis.

b. Standing Water - The Contractor provide temporary drainage during construction to avoid standing water.

c. Tall Grass and Seeds - The Contractor shall adhere to the requirements of Section T-901, Seeding of the contract documents and specifications.

d. Poorly Maintained Fencing and Gates - The Contractor shall immediately report any damage to gates or fences. The Contractor will be responsible for repairs to any gates or fences caused by negligence by the Contractor.

e. Disruption of Existing Wildlife Habitat - The Contractor shall notify the airport immediately of any wildlife sightings.

100-2.7 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT.

The Contractor shall ensure that the pavement surfaces in the active movement area are kept clean from dirt, mud, and other debris from the Contractor's equipment. Frequent clean up in the vicinity of Contractor's work areas is required.

The Contractor shall require vehicle operators to check tires prior to traversing active airfield pavement. Any material tracked onto an active airfield pavement by construction equipment shall be immediately removed. See AC 150/1510-24, foreign object debris (FOD) management (www.faa.gov) for further instruction.

100-2.8 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT.

If any construction vehicle or equipment is operated within airport property, the Contractor must be adequately prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks. Special care must also be taken when handling or transporting hazardous materials on airport property. The contractor shall notify the Engineer immediately after any hazardous material spill. Management of hazardous wastes must strictly follow the most current stringent Federal, State and local regulations governing treatment, storage, and disposal. See AC 150/5320-15, management of airport industrial waste (www.faa.gov), for further instruction.

100-2.9 NOTIFICATION OF CONSTRUCTION ACTIVITIES.

a. List of Responsible Representatives - A point of contact list will be completed as part of ITEM SS-101 Safety Plan Compliance Document (SPCD) and will be delivered to all parties prior to construction.

b. Notices to Airmen (NOTAM) - Before beginning any construction activity, the Contractor must, through the airport operator, give notice using the NOTAM system of proposed location, time, and date of commencement of construction. Upon completion of work and return of all such areas to standard conditions, the Contractor must, through the airport operator, verify the cancellation of all notices issued via the NOTAM system giving a 72 hour (weekdays) advance notice.

c. Emergency Notification Procedures - In the event of an emergency, the Contractor shall call airport emergency response 719-4950; and 911. Contractor is to also immediately notify the Engineer.

d. Coordination with ARFF personnel - Any deactivation of water lines or hydrants, rerouting of access routes, or use of hazardous materials on the airfield shall be coordinated and approved by the airport's ARFF personnel prior to execution of such activities.

e. Notification to the FAA - The Contractor shall ensure, through the Engineer, that all construction equipment over 25-ft in height is air spaced through the appropriate FAA regional or district office prior to using such equipment on site.

Shutdown of any NAVAID (airport or FAA owned) shall be coordinated with the FAA ATO 45 days prior to the proposed shutdown. The Contractor shall provide an additional seven days advance notice to the airport to coordinate with the FAA ATO Tech Ops office responsible for the FAA facilities.

100-2.10 INSPECTION REQUIREMENTS.

a. Daily Inspections - The Contractor shall perform daily safety inspections to ensure all construction operations are in conformance with the CSPP.

b. Final Inspections - Prior to opening any portion of the airport to traffic, the Contractor, Engineer, and airport operator shall perform a safety inspection of the area to be opened to traffic to ensure conformance with the CSPP and FAA standards.

100-2.11 UNDERGROUND UTILITIES. Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown. Prior to beginning any type of excavation, the contractor shall contact the utilities involved and make arrangements for the location of the utilities on the ground. The contractor shall maintain the utility location markings until they are no longer necessary.

Texas state law, the underground facilities damage prevention act, requires ten working days advance notification through the one-call system center before excavating using mechanized equipment or explosives (except in the case of an emergency). The one-call system phone number is 1-800-245-4848, or 811. The contractor is advised that there is a severe penalty for not making this call. Not all utility companies are members of the one-call system; therefore, the contractor is advised to contact all non-member utilities as well as the one-call system.

Due to FAA underground cables being located in the areas depicted in the plans, the contractor shall use extreme caution when working in these areas. The Contractor shall notify FAA ATO Ops personnel a minimum of 10 days prior to construction in these areas to ensure no FAA utilities will be impacted. Any FAA equipment or utilities damaged during construction shall be replaced by the contractor at no expense to the owner or the FAA.

100-2.12 PENALTIES. Failure of the Contractor (including employees) or any of his subcontractors (including employees) to comply with ATCT instructions, the airport safety plan, or any of the other requirements of the airport while operating on airport property, shall be subject to the following:

a. First Offense - The Contractor shall receive a fine of $1,000.00, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fines or penalties imposed on the airport as a result of the incident will be assessed to the Contractor.

b. Second Offense - The Contractor shall receive a fine of $5,000.00 to be deducted from any monies due him, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fine or penalties imposed on the airport as a result of the incident will be assessed to the contractor.

c. Third Offense - Work will be suspended. The Contractor (including employees) and any of his subcontractors (including employees) who will operate ground vehicles on the airport shall successfully complete, for a second time, formalized airport safety training, to be conducted by airport staff. When the contractor's employees have completed airport safety training to the satisfaction of the owner, work may continue at the discretion of the Owner.

100-2.13 RUNWAY AND TAXIWAY VISUAL AIDS.

a. General - All airport markings, lighting, signs, and visual NAVAIDs that are in operation must be clear from all obstructions. All temporary markings, signs, lights, or other visual aids must be secured in place to prevent prop wash, jet blast, wing vortices, or other wind currents.

b. Markings - All temporary or permanent runway and taxiway visual aids shall conform to the requirements of the most recent edition of FAA AC 150/5340-1 (www.faa.gov). Markings for this project include the following:

i. Temporarily Closed Taxiways – The Contractor shall be responsible for furnishing, installing, and maintaining taxiway closure markers at the entrance to the closed taxiway from the adjacent runway. The taxiway closure markers shall be installed inside the runway safety area. The

contractor shall also furnish and install low profile barricades at the entrance to the closed taxiway from an adjacent taxiway. Barricades shall be installed outside all active taxiway safety areas. See details on construction safety drawings for closed taxiway marker and low-profile aircraft barricade details.

c. Lighting and Visual Aids – All temporary lighting for runway and taxiway systems shall conform to the requirements of the most recent edition of FAA AC 150/5340-30 and 150/5345-50 (www.faa.gov). The contractor shall be responsible for disconnecting isolation transformers associated with any runway or taxiway light fixtures that are being disconnected.

d. Signs - The Contractor shall install all signs in accordance with the most recent edition of FAA AC 150/5345-44 and 150/5340-18. Any sign that is not performing its normal function must be covered or removed to prevent misleading pilots.

100-2.14 MARKING AND SIGNS FOR ACCESS ROUTES. The contractor shall be responsible for supplying and installing all necessary markings and signage for all access routes to and from the site to be used by contractor personnel, subcontractor personnel, or delivery operations. All signage in the air operations area shall be frangible mounted.

100-2.15 HAZARD MARKING AND LIGHTING

a. Purpose - Hazard marking and lighting prevents pilots from entering areas closed to aircraft and prevents contractor personnel from entering areas open to aircraft.

b. Equipment - The contractor shall furnish, install, and maintain low-profile barricades in hazardous areas inside movement areas. Barricades shall restrict access and make hazards obvious to aircraft, personnel, and vehicles. During periods of low visibility and at night, barricades shall be equipped with red flashing or steady burning lights. The spacing of barricades shall be such that a breach is physically prevented barring a deliberate act. If barricades are intended to prevent pedestrians, then they shall be linked. See details on construction safety drawings for low-profile aircraft barricade detail.

100-2.16 PROTECTION OF SAFETY AREAS, OBJECT FREE AREAS, OBJECT FREE ZONES, AND APPROACH/DEPARTURE SURFACES:

a. Runway Safety Areas (RSA) - No work shall be permitted within an active RSA. If required, adjustments to the RSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. The Contractor shall insure adequate distance protection for blast projection, as needed. All open trenches or excavations within the limits of the RSA shall be back filled or covered prior to opening the runway to operations. In addition, erosion control measures shall be provided in the RSA to prevent ruts, humps, or depressions inside the limits of the RSA.

b. Runway object free areas (ROFA) - No material shall be stockpiled inside the limits of the active ROFA unless approved by air spacing through the appropriate FAA airports regional or district office.

c. Taxiway safety areas (TSA) - No work shall be permitted within an active TSA. If required, adjustments to the taxiway TSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. All open trenches or excavations within the limits of the TSA shall be back filled or covered prior to opening the taxiway to operations. In addition, erosion control measures shall be provided in the TSA to prevent ruts, humps, or depressions inside the limits of the TSA.

d. Taxiway Object Free Areas (TOFA) - No construction shall be permitted inside an active TOFA unless the taxiway has been restricted to operations requiring a TOFA equal to that of the TOFA available. If required, construction may be permitted inside the TOFA if the taxiway centerline markings are offset with centerline reflectors or lighting, or appropriate NOTAMs are issued. Construction may also be permitted inside the TOFA if a five foot wing tip clearance is maintained for all construction equipment

and vehicles. In this scenario, flaggers and wing walkers must be used to direct traffic through the construction site.

e. Obstacle Free Zone (OFZ) - No personnel, material, or equipment shall penetrate the OFZ while the runway is open to operations. The dimensions of the OFZ are as defined in FAA AC 150/5300-13 (www.faa.gov).

f. Approach/Departure Surfaces - All contractor personnel, materials, and equipment shall remain clear of the applicable threshold siting surfaces as defined in Chapter 3 of FAA AC 150/5300-13 (www.faa.gov). Construction activities that require penetration into the threshold siting surface shall be accomplish through displacing or partially closing the runway. Such construction activities shall require coordination with the FAA airports regional or district office.

100-2.17 OTHER LIMITATIONS ON CONSTRUCTION

a. Prohibitions - The use of equipment (i.e. cranes, concrete pumps) over 35 feet in height shall not be used unless approved by the engineer and proper coordination for FAA aeronautical study is completed. The submittal for this coordination shall take place at least 45 days prior to anticipated use.

Open flame welding and torch cutting operations are not permitted unless adequate fire safety precautions are provided and these operations are authorized by the airport operator and the engineer.

Electrical blasting caps shall not be permitted within 1,000-ft of the airport property. Flare pots are not permitted within the air operations area.

MEASUREMENT AND PAYMENT

100-3.1 Adherence to the requirements of the CSPP will not be measured for separate payment.

END OF ITEM SS-100

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ITEM SS-101 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

DESCRIPTION

101-1.1 The contractor shall thoroughly review the approved Construction Safety and Phasing Plan (CSPP) and shall comply with approved CSPP. The contractor shall certify such compliance by completing the attached SPCD and submitting to the Engineer for approval.

Contractor Safety Plan Compliance Documents

Owner Name: Jefferson County

Airport: Jack Brooks Regional Airport

Project Description: Taxiway 'D' Reconstruction (2017)

Contractor: _____

Each item listed below corresponds to a specific section of the approved CSPP. The contractor shall certify that he/she will comply with each section of the approved CSPP. Each certified section with a "no" response must be fully explained in an attachment to the SPCD. The document shall be signed and dated by a principle or owner in the Contractor's company. All other requested information shall be completed by the Contractor and submitted to the Engineer for approval as part of the SPCD.

1. **Section 1 - Correspondence:** This project shall be completed in accordance with Section 1 "Coordination" of the approved Construction Safety Plan Compliance Document.

Owner:	
Contact: Alex Rupp, Airport Manager	**Phone:** 409-719-4900
Engineer:	
Project Manager: Tom Dodson	**Phone:** 713-491-8333
Project Engineer: Javier Suarez	**Phone:** 713-491-8333
Construction Observer: Steve Escagne	**Phone:** 972-951-8234
Materials Testing: Liana Collier	**Phone:** 409-377-4991
Contractor:	
Project Manager:	**Phone:**
Superintendent:	**Phone:**
Subcontractors:	
LIST ALL SUBS	

Yes_____No_*

2. **Section 2 - Phasing:** This project shall be completed in accordance with Section 2 "Phasing" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

3. **Section 3 – Areas of Operations Affected by Construction Activity:** This project shall be completed in accordance with Section 3 "Areas of Operations Affected by Construction Activity" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

4. **Section 4 – Protection of Navigational Aids (NAVAIDS):** This project shall be completed in accordance with Section 4 "Protection of Navigational Aids (NAVAIDS)" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

5. **Section 5 – Contractor Access:** This project shall be completed in accordance with Section 5 "Contractor Access" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

6. **Section 6 – Wildlife Management:** This project shall be completed in accordance with Section 6 "Wildlife Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

7. **Section 7 – Foreign Object Debris (FOD) Management:** This project shall be completed in accordance with Section 7 "Foreign Object Debris (FOD) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

8. **Section 8 – Hazardous Materials (HAZMAT) Management:** This project shall be completed in accordance with Section 8 "Hazardous Materials (HAZMAT) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

9. **Section 9 – Notification of Construction Activities:** This project shall be completed in accordance with Section 9 "Notification of Construction Activities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

10. **Section 10 – Inspection Requirements:** This project shall be completed in accordance with Section 10 "Inspection Requirements" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

11. **Section 11 – Underground Utilities:** This project shall be completed in accordance with Section 11 "Underground Utilities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

12. **Section 12 – Penalties:** This project shall be completed in accordance with Section 12 "Penalties" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

13. **Section 13 – Special Conditions:** This project shall be completed in accordance with Section 13 "Special Conditions" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

14. **Section 14 – Runway and Taxiway Visual Aids:** This project shall be completed in accordance with 14 "Runway and Taxiway Visual Aids" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

15. **Section 15 – Marking and Signs for Access Routes:** This project shall be completed in accordance with Section 15 "Marking and Signs for Access Routes" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

16. **Section 16 – Hazard Marking and Lighting:** This project shall be completed in accordance with Section 16 "Hazard Marking and Lighting" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

17. **Section 17 – Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces:** This project shall be completed in accordance with Section 17 "Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

18. **Section 18 – Other Limitations on Construction:** This project shall be completed in accordance with Section 18 "Other Limitations on Construction" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

I certify that, for the project identified herein, the responses to the foregoing items are correct as marked, and that I shall comply with the approved Construction Safety and Plan.

Signed: _____
Contractor's Authorized Representative

Date: _____

_____
Print Name and Title of Contractor's Representative

END OF ITEM SS-101

ITEM SS-110 STANDARD SPECIFICATIONS

GENERAL

110-1.1 The standard specifications adopted by the Texas Department of Transportation (November 1, 2014) are bound in a book titled "Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges". These specifications are referred to herein as "Standard Specifications." The latest edition shall apply. A copy of these "Standard Specifications" may be purchased or downloaded by going to the Texas Department of Transportation's web page, http://www.txdot.gov, contacting Support Services Division, or calling the Texas Department of Transportation's Support Services Division. For additional information on specifications or information on Departmental Materials Specifications (DMS), Material Producer Lists (MPL), Test Procedures, Material Inspection Guide, and other materials information, go to http://www.txdot.gov.

INCORPORATION AND MODIFICATION

110-2.1 Certain parts of the Standard Specifications are appropriate for inclusion in these Technical Specifications. Such parts are incorporated herein by reference to the proper section or paragraph number. The individual specification numbers noted herein may be different from those in the latest edition of the "Standard Specifications." The most current specification number shall apply. Each such referenced part shall be considered to be a part of these Contract Documents as though copied herein in full.

110-2.2 Certain referenced parts of the Standard Specifications are modified in the Specifications that follow. In case of conflict between the Standard Specifications and the Specifications that follow, the Specifications that follow shall govern.

110-2.3 Individual material test numbers change from time to time. Use the latest applicable test.

110-2.4 Reference in the Standard Specifications to the "Department" is herein changed to the "Owner".

END OF ITEM SS-110

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ITEM SS-120 SITE PREPARATION

DESCRIPTION

120-1.1 This item covers the preparation of the site for construction of the proposed improvements. The attention of the bidder is directed to the necessity for careful examination of the entire project site to determine, at the time of bid preparation, the full extent of work to be done under the item "Site Preparation." The entire job site shall be cleared of all man-made obstructions and debris, of whatever nature, and made ready in all respects for the construction of the proposed improvements.

The item "Site Preparation" shall include:

1. Mobilization
2. Furnishing Temporary Field Office
3. Lighted Barricades and Closed Taxiway and Runway Markings
4. Contractor's Access/Haul Road
5. Contractor's Staging Areas
6. Lockout/Tagout Program
7. Airport Security Requirements
8. Airport Safety Requirements
9. Instrument Control
10. Clean Up

CONSTRUCTION METHODS

120-2.1 MOBILIZATION. The Contractor shall consider and include his cost for providing personnel, equipment, materials, bonds, etc. required for the prosecution of the work under this item. This is in unison with Mobilization as described in the General Conditions Section 105.

120-2.2 FURNISHING TEMPORARY FIELD OFFICE. The building for the temporary field office shall be for the exclusive use by the Engineer as a field office and shall conform to the requirements listed below. The dimensions and other requirements specified herein are minimums and the building may be built by the Contractor for the specific purposes noted herein. It is not intended, however, to prohibit the use of commercially built trailers or prefabricated buildings which may deviate in minor dimension or detail from the requirements listed herein but may in some features exceed the listed requirements and in all major respects be entirely suitable for the purpose intended. The Engineer will determine the suitability of any building furnished. It shall be the responsibility of the Contractor to coordinate and obtain also necessary permits and install all required temporary facilities to provide a complete and usable temporary field office.

Minimum requirements for offices:

a. The building may be portable or other suitable type with 7-ft minimum ceiling height; must be floored, weatherproof and reasonably dustproof; must have at least two glazed sliding windows provided with window latches; must have at least one door provided with a substantial lock and all keys placed in the possession of the Engineer. Doors and windows shall be screened. The building need not be new but the facility furnished under this item shall be neat, clean, sound and usable for the purpose intended.

b. The building shall be provided with electric lights and power outlets arranged as directed by the Engineer. The building shall be provided with equipment in good working order. In cold weather

the building shall be provided with adequate vented space heating facilities and fuel for heating. In hot weather the building shall be equipped with adequate air conditioning units. Heating and cooling and telephone utility service will be furnished at no cost to the Owner or Engineer.

c. The building for the field office shall provide not less than 240 sq. ft. of floor space. At least two tables each suitable for desk and drafting table work shall be provided with approximate dimensions of 30" x 48". These tables may be movable, attached to a wall, or built-in. Each table will be provided with at least two drawers (minimum dimensions: 8" deep x 12" wide by 24" long) or equivalent cabinet or shelf space for storing field books and records.

d. The building shall be provided with internet access with a minimum download speed of 24 megabytes per second. This service shall be provided for the length of the contract or construction project, whichever is greater.

Furnishing the field office will not be measured for separate payment, but will be considered subsidiary to "Site Preparation." The building shall remain the property of the Contractor and be returned to him at the close of the construction period.

120-2.3 LIGHTED BARRICADES AND CLOSED TAXIWAY AND RUNWAY MARKINGS. The Contractor shall furnish, install, maintain, and remove closed taxiway and runway markings and lighted barricades in accordance with details on the plans and as directed by the Engineer. The closed runway markers shall be aviation yellow, nylon-reinforced vinyl. The markers shall be secured to the pavement/ground as shown on the plans and as directed by the Engineer. The lighted barricades shall be constructed and installed as shown on the plans. All lighted barricades and closed taxiway and runway markings shall be constructed in accordance with AC 150/5370-2F Operational Safety on Airports During Construction.

All work involved in the furnishing, installation, maintenance, and removal of lighted barricades, barrels and closed runway markings will not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation."

120-2.4 CONTRACTOR'S ACCESS/HAUL ROAD. The Contractor shall layout, construct, maintain, and repair all access/haul roads needed to construct the work. The contractor shall video the any intended haul routes from the edge of airport property to the construction work areas. The existing access roads shown on the plans shall be repaired, as determined necessary by the Engineer, at the close of the project. All such work, including all materials and labor, involved in the layout, construction, maintenance, and repair of the Contractor's access/haul roads will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation." Temporary pipe culverts shall be installed and maintained as required and shall be of the size as directed by the Engineer. The type of pipe used for temporary pipe shall be at the option of the Contractor. Temporary pipe culverts will not be measured for separate payment, but will be considered subsidiary to the access/haul road. All temporary pipe culverts shall be removed by the Contractor and shall remain his property at the close of the project.

120-2.5 CONTRACTOR'S STAGING AREAS. The areas designated in the plans or by the Engineer as the Contractor's staging area shall be cleared and graded by the Contractor as needed for use by the Contractor in constructing the work on this project. All areas used or otherwise occupied by the Contractor for his operations shall be cleaned, regraded, and seeded, as directed by the Engineer, prior to the final acceptance of the project by the Airport. All work involved in the preparation and restoration of areas used or occupied by the Contractor, including clearing, grubbing, regrading, seeding, and installing and removing fence, will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.6 LOCKOUT / TAGOUT PROGRAM. The Contractor shall submit a complete copy of an electrical energy source Lockout/Tagout Program in accordance with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, that meets the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and the related safety requirements are the sole responsibility of the Contractor.

120-2.7 AIRPORT SECURITY REQUIREMENTS. The Contractor shall abide by the Airport Security requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. Any costs associated with the Airport Security requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.8 AIRPORT SAFETY REQUIREMENTS. The Contractor shall abide by the Airport Safety requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. All costs associated with the Airport Safety requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.9 INSTRUMENT CONTROL. The Contractor will be furnished survey baselines and benchmarks to control the work as shown on the Plans. The Contractor shall be responsible for the additional instrument control necessary to layout and construct the work. The Contractor shall provide the instrument control as provided for in Section 50 of the General Provisions. The Contractor's instrument control of the work shall not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation".

120-2.10 CLEAN UP. From time to time, the Contractor shall clean up the site in order that the site presents a neat appearance and that the progress of work will not be impeded. One such clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

MEASUREMENT AND PAYMENT

120-3.1 Site preparation will be measured as a lump sum complete item. Work completed and accepted under this item will be paid for at the contract lump sum price bid for "Site Preparation," which price shall be full compensation for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Item SS-120-1 Site Preparation - per Lump Sum

A minimum of two (2) partial payments will be made for Site Preparation up to a limit based on a percentage of the Total Contract Value and not the amount bid. Periodic payments will be made in proportion to the amount of work accepted for payment in monthly pay applications, as outlined in the table below.

Monthly Pay Application Total exceeds	Partial Payment of Site Preparation
1% of total Contract value	50% of Site Preparation, up to 2.5% of total Contract value, less retainage
5% of total Contract value	100% of Site Preparation, up to 5% of total Contract value, less retainage

Any remaining partial payments for "Site Preparation" will be when the work is completed to 95% of the Contract total value.

END OF ITEM SS-120

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ITEM SS-300 BASIC ELECTRICAL REQUIREMENTS

DESCRIPTION

300-1.1 This item shall consist of furnishing and installing complete electrical systems as defined in the plans and in these specifications. The work includes the installation, connection and testing of new electrical systems, equipment and all required appurtenances to construct and demonstrate proper operation of the completed electrical systems.

300-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars and standards on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

300-1.3 This work shall consist of lockout/tagout and constant current regulator calibration procedures at the airport electrical vault in accordance with the design and details shown in the plans and in compliance with these specification documents.

EQUIPMENT AND MATERIALS

300-2.1 STANDARDS.

a. Applicable National Fire Protection Association (NFPA) codes, including but not limited to:
   (1) NFPA 70 - National Electrical Code.
   (2) NFPA 70E - Standard for Electrical Safety in the Workplace.
   (3) NFPA 72 - National Fire Alarm Code.
   (4) NFPA 101 - Life Safety Code.
   (5) Internet Website: http://www.nfpa.org

b. Applicable Code of Federal Regulations (CFR) codes, including but not limited to:
   (1) 29 CFR 1910 - Occupational Safety and Health Standards (OSHA)
   (2) 29 CFR 1926 - Safety and Health Regulations for Construction.
   (3) Internet Website: http://www.gpoaccess.gov/cfr/index.html

c. ANSI/IEEE C2 - National Electrical Safety Code.

d. NECA 1 – Standard for Good Workmanship in Electrical Construction.

e. Applicable Federal, State and Local Electrical Codes.

f. Applicable Federal, State and Local Energy Codes.

g. Applicable Federal, State and Local Building Codes.

h. Applicable Federal, State and Local Fire Codes.

i. Applicable City Electrical Code.

j. Applicable City Ordinances pertaining to electrical work.

k. Applicable Federal, State and Local - Environmental, Health and Safety Laws and Regulations.

Contractor shall utilize the most current editions of standards, which are current at time of bid and as recognized by the Authority Having Jurisdiction for the respective standard.

300-2.2 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, current version on the date that the submittals are received by the Engineer.

b. Airport lighting equipment and materials shall also meet the Buy American Preference requirements in 49 USC 50101 and the Aviation Safety and Capacity Expansion Act. The equipment

shall be approved and listed on the FAA "Equipment Meeting Buy American Requirements" list located at *www.faa.gov/airports/aip/procurement/federal_contract_provisions/*, current version on the date that the submittals are received by the Engineer, or the Contractor may submit a signed formal letter from the manufacturer that clearly lists the specific equipment, model number, location where it is manufactured, and statement certifying that the equipment and/or materials meet the Buy American Preference requirements.

c. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer. All equipment and materials shall be new and meet applicable manufacturer's standards. All other electrical components and products, not covered under the FAA equipment certification program, shall be tested and listed by an OSHA accepted, nationally recognized testing laboratory (NRTL) to conform to the standards indicated in these contract documents and to the industry standards required in the NEC, NEMA, IEEE, UL, and applicable FAA advisory circulars.

d. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

e. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components or electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

f. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

g. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

(1) All LED light fixtures, with the exception of obstruction lighting, shall be warranted by the manufacturer for a minimum of 4 years after date of installation, final acceptance testing by the Engineer, and Owner's beneficial use of the equipment, inclusive of all electronics. Refer to FAA Engineering Brief No. 67D for additional requirements.

h. Refer to Special Provisions item C-12 Submittals for electronic or paper submittal requirements for Engineer's review.

i. After approval of submitted equipment, the Contractor shall supply the following Operation and Maintenance Manual documentation to the Owner. Two (2) complete sets of documentation shall be supplied for each model of equipment. The documentation shall be securely bound in heavy-duty 3-ring binders. The information for each piece of equipment shall be indexed using typewritten label tabs. The

spine of each binder shall have a typewritten label, which indicates the included equipment types. The documentation shall include:

(1) Approved Submittals and Shop Drawings
(2) Cable Splicer Qualifications, Type and Voltage
(3) State Contractors License with Electrical Classification
(4) Master, Journeyman and Apprentice Electrician Licenses and Certifications
(5) Lockout/Tagout Program
(6) Regulator Load and Calibration Reports for testing, checking and adjusting all regulators in the electrical vault
(7) Megger Test Reports
(8) Ground Rod Test Reports
(9) Installation Manuals
(10) Operation Manuals
(11) Maintenance Manuals
(12) Parts Lists, including recommended spare parts. Recommended spare parts shall be furnished with the respective equipment.

j. After approval of the O&M Manuals, the Contractor shall provide three (3) complete electronic copies of all documentation in Adobe PDF file format on CD-R (non-rewriteable) discs storage media. The electronic files shall contain searchable text and include a hyperlink index for ease in locating information with the PDF file.

k. All requirements herein Item SS-300 shall be applicable to all referenced sections in these contract documents and applicable to all sections which reference Item SS-300.

l. The Contractor is the single source of responsibility for the installation and integration of the airport's lighting, power, and control systems. New airport lighting equipment and materials shall be fully compatible with all other new and existing airport lighting equipment and systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-2.3 OPERATION AND MAINTENANCE DATA.

Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment. Provide bound hard copies and electronic copies as noted in section 300-2.2.

a. Certificate of Substantial Completion, Release and Contractor's Affidavit, executed copies.

b. Final approved equipment submittals, including product data sheets and shop drawings, clearly labeled.

c. Preventive maintenance programs for the visual aid facilities and equipment installed in this project, including the applicable equipment sections within Chapter 5 "Preventive Maintenance" from AC 150/5340-26 (latest edition) "Maintenance of Airport Visual Aid Facilities".

d. Installation manuals: Description of function, installation and calibration manuals, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

e. Operations manuals: Manufacturer's printed operating instructions and procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping,

shutdown, and emergency instructions; summer and winter operating instructions; and all programming and equipment settings.

f. Maintenance manuals: Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

g. Service manuals: Servicing instructions and lubrication charts and schedules, including the names and telephone numbers of personnel to contact for both routine periodic and warranty service for equipment and materials provided under this Specification.

h. Final test reports, clearly labeled, including but not limited to, insulation resistance test reports, ground rod impedance test reports, cable pulling tension values logs, and equipment certification tests.

i. Final certified calibration sheets for all equipment and instruments, including but not limited to, constant current regulator calibration reports.

300-2.4 WIRE. Unless otherwise indicated, conductors No. 10 AWG and smaller shall be solid, and conductors No. 8 AWG and larger shall be stranded.

For electrical work of 600 volts or less, all conductors, terminations, terminal blocks, lugs, connectors, devices and equipment shall be listed, marked, and rated 75 degrees C minimum unless otherwise noted.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway. Pull ropes and pull wires shall have sufficient tensile strength for the cable(s) to be pulled and installed. Damaged cable or raceway shall be replaced at no additional cost to the Owner.

Install pull wires in empty raceways. Use a polypropylene plastic line with not less than 200 pound tensile strength. Secure and leave at least 12 inches of slack at each end of pull wire to prevent it from slipping back into the conduit. Cap spare raceways with removable tapered plugs, designed for this purpose.

Colorable L-824 cable in solid non-fading colors shall not be used for permanent series circuit identification. The color coding shall be continuous throughout the facility and airfield for each series circuit and conductor so that the circuit and conductor are readily identifiable. Mixing of colors for a series circuit is unacceptable.

300-2.5 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, with a minimum 28-day compressive strength of 3500 PSI (unless otherwise noted) using 1-inch (25-mm) maximum size coarse aggregate, as determined by test cylinders made in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Flowable backfill material may only be used where specifically indicated in the Plan details.

300-2.6 SWITCHES. Main disconnect switches 600 volt or less shall be UL service entrance rated, industrial circuit breaker type, pad-lockable, heavy duty type with neutral and ground kits and poles and ratings as indicated on the drawings and suitable for the application indicated. Exterior switches shall be NEMA 3R rated.

300-2.7 WIND CONES AND SEGMENTED CIRCLES.

Provide the wind cone with an L-810 obstruction light, installed as indicated in the plans and in accordance with the manufacturer's recommendations.

The segmented circle airport marker system shall conform to the requirements of AC 150/5340-5, Segmented Circle Airport Marker System. Install the segmented circle. Submit shop drawings for review and approval by the Engineer prior to field construction work.

CONSTRUCTION METHODS

300-3.1 LOCKOUT/TAGOUT PROGRAM. The Contractor shall provide a complete copy of an electrical energy source Lockout/Tagout Program to the Owner, with copy to the Engineer. The document shall clearly identify the on-site master electricians and their contact information, including office and mobile telephone numbers.

The Lockout/Tagout Program shall comply with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, and meet the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and all other related safety requirements are the sole responsibility of the Contractor.

300-3.2 SAFETY PROGRAM. The Contractor shall implement an electrical safety program that complies with NFPA 70E and 29 CFR 1926.

Implementation of the Electrical Safety Program, determining and providing proper Personal Protective Equipment (PPE), training and enforcing personnel to wear the prescribed PPE, conducting work area safety inspections (including correcting deficiencies), and all other related safety requirements are the sole responsibility of the Contractor.

All work involved in the preparation and implementation of the safety program will not be measured for separate payment, but will be considered subsidiary to the lockout/tagout bid item.

300-3.3 PRECONSTRUCTION MEETING.

A preconstruction meeting will be held with the Airport, FAA, Engineer and Contractor, prior to any work. Complete submittals and shop drawings will be submitted at this time for review. An equipment procurement schedule will be provided by the Contractor with an anticipated field construction start date. The progress construction schedule will be submitted for review each week and shall outline all installation, testing and demolition work.

300-3.4 GENERAL. In general, the various electrical equipment and material to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards so as to complete the work in a neat and satisfactory manner. The following is a general outline concerning the running of various systems and is to be excepted where the drawings or conditions at the buildings necessitate deviating from these standards.

The drawings and specifications are complementary; any work required by one, but not by the other, shall be performed as though required by both.

All conduits shall be run exposed in the equipment rooms, or run concealed as indicated.

The construction details of the building are illustrated on the drawings. Each Contractor shall thoroughly acquaint himself with the details before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details.

The electrical plans do not give exact locations, etc., and do not show all the offsets, control lines, junction boxes, and other installation details. Each Contractor shall carefully lay out his work at the site to

conform to the job conditions, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide complete operating systems.

The electrical plans show diagrammatically the locations of the various electrical outlets and apparatus and the method of circulating and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, etc., by measurements at the buildings, and in cooperation with other crafts, and in all cases shall be subject to the approval of the Engineer. The Engineer reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

These Specifications and the accompanying Drawings are intended to cover systems which will not interfere with the structure of the buildings, which will fit into the several available spaces, and which will insure complete and satisfactory systems. Each bidder shall be responsible for the proper fitting of his material and apparatus into the buildings.

Should the particular equipment which any bidder proposes to install require other space conditions than those indicated on the Drawings, he shall arrange for such space with the Engineer before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such changes at the Contractor's expense.

Should the particular equipment which any bidder proposes to install require other installation methods, such as larger light base junction structures, etc., he shall include all such equipment and appurtenances in his bid. Should changes become necessary on account of failure to coordinate equipment requirements and comply with this clause, the Contractor shall make such changes at the Contractor's expense.

The Contractor shall be responsible to see that each party furnishes electrical equipment which meets the electrical requirements specified herein and that all systems work together to produce the specified operation.

Where two or more units of the same kind or class of equipment are required, these shall be products of a single manufacturer; however, the component parts need not be the products of one manufacturer.

Each Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these Specifications and Plans, which shall be checked by the Engineer and approved before the work is started, and interferences with the structural conditions shall be corrected by the Contractor before the work proceeds.

Electrical equipment, such as switchgear, switchboards, panelboards, load centers and other power supply equipment, shall not be used as a common enclosure, pull box or junction box for routing conductors of different systems, unless the equipment is specifically designed for this purpose and indicated as such on the Plans.

All electrical equipment shall be securely mounted as indicated in the plans, as required by the contract specifications, as required by guidelines and codes, and as required by the manufacturer using hardware compliant with the environmental conditions.

Interior components of electrical enclosures shall be securely mounted using appropriate hardware within the enclosure. Adhesives or adhesive tapes/strips are not allowed and are prohibited.

Electrical components, including but not limited to, relays, circuit boards, electronics, etc, shall be installed within approved enclosures.

The Contractor shall keep ends of conduits, including those extending through roofs, equipment and fixtures covered or closed with caps or plugs to prevent foreign material from entering during construction.

Where portions of raceways are known to be subjected to different temperatures, where condensation is a problem, and where passing from interior to exterior of a building, the portion of raceway or sleeve shall be filled with an approved material to prevent the circulation of air, prevent condensation, and prevent moisture entry. Sealing of raceways shall not occur until after the conductors and cables have been installed, tested and accepted by the Engineer.

The Contractor shall install any temporary lines and connections required to maintain electric services and safely remove and dispose of them when complete.

All temporary wiring shall conform to OSHA standards. Remove temporary services when work is complete. Any damage to electrical equipment caused by the Contractor shall be repaired at no cost to the Owner.

All non-current carrying parts and neutrals shall be grounded as indicated on the Drawings or as required by the Codes.

White and/or gray outer finish conductors may only be used as grounded conductors or neutral conductors in accordance with NEC.

Install insulated green equipment grounding conductors with all feeder and branch circuits.

Provide separate insulated equipment grounding conductors from grounding system to each electrical equipment, telecommunication equipment, other special electrical system equipment, and appurtenance item location in accordance with NFPA 70 and other applicable standard requirements.

The bidder shall inspect the site, thoroughly acquaint himself with conditions to be met and work to be accomplished. Failure to comply with this shall not constitute grounds for any additional payments.

Where electrical equipment is installed that causes electrical noise interference with other systems either existing or installed under this contract, the offending equipment shall be equipped with isolating transformers, filters, reactors, shielding, or any other means as required for the satisfactory suppression of the interferences, as determined by the Engineer.

All junction boxes, expansion joints, flexible connections, instruments and similar items requiring servicing or repairs shall be installed in an accessible location.

All salvage and equipment removed by the work shall remain the property of the Owner. Material removed from the project shall be stored on the project site where and as directed. Debris shall be removed from the job site and disposed of by the Contractor.

The Contractor shall maintain his work area clean and orderly at all times. Debris shall be removed promptly. The electrical system shall be thoroughly cleaned inside and outside of all enclosures to remove all metal shavings or other work debris, dust, concrete splatter, plaster, paint and lint.

The Contractor shall do all excavating and backfilling made necessary by electrical work and shall remove all surplus or supply any earth required to establish the proper finished grade.

The Contractor shall do all cutting and patching made necessary by electrical work, but in no case shall he cut through or into any structural member without written permission of the Engineer.

All steel conduits, supports, channels, fittings, nuts, bolts, etc. shall be galvanized, corrosion-resistant type unless otherwise noted.

An approved anti-seize compound shall be used on all threads to prevent equipment and thread damage.

Equipment shall be installed in accordance with manufacturer's recommendation. Make all final electrical connections and coordinate all items with other trades.

Correct unnecessary damage caused due to installation of work, brought about through carelessness or lack of coordination. All openings, sleeves, and holes to be properly sealed, fire proofed and water proofed. Any water leaks arising from project construction will be immediately corrected to the satisfaction of the Owner and the Engineer.

The soil surrounding all installed equipment shall be sterilized a distance of 2 feet, in all directions, with the soil sterilant Pramitol or other sterilant approved by the Engineer.

300-3.5 DUCT AND CONDUIT. Conduits shall be galvanized rigid steel unless otherwise indicated or specified. Refer to one-line diagram conduit notes for specific requirements.

Conduit runs shall be one trade size continuously with no reducers allowed. Changing of conduit size is only permitted at manholes, handholes, and boxes and conduit bodies used as outlet, device, junction, or pull boxes, including approved, listed fittings with removable covers.

Use an approved, listed adapter/coupling to convert to other types of conduit. Reducer couplings are not allowed.

For underground service entrance, feeder and branch circuit raceways, offsets and bends over 30 degrees and elbows in Schedule 40 PVC conduit runs shall be Schedule 80 PVC conduit. Underground service entrance PVC conduits shall be concrete encased unless otherwise noted. Underground PVC conduits shall be concrete encased under driveways, roadways, parking lots and other paved areas.

Non-encased conduits shall convert to concrete encased ducts under all paved areas and shall extend at least 3 feet beyond the edges of the pavement unless otherwise noted.

The Contractor shall provide a staked centerline or offset for the duct and manhole system - utilizing the drawings and a site inspection of the existing grounds, grades and utility crossings. The Owner and Engineer shall approve the staking plan that shall be indicated on a drawing submitted for approval before starting any excavation for the ducts. The staking plan shall indicate the proposed location, elevation and dimensions of manholes and handholes. The Engineer reserves the right to adjust duct, manhole and handhole locations and elevations before installation at no additional cost to the Owner.

The bottom surface of trenches shall be essentially smooth and free from coarse aggregate.

Install grounding-and-bonding type bushings and bonding jumpers on all service entrance conduits and on all feeder and branch circuit conduits.

Use conduit bushings at each conduit termination. Where No. 4 AWG or larger ungrounded wire is installed, use insulated bushings.

When EMT is allowed, utilize only steel compression fittings. Die-cast and set-screw fittings shall not be used.

Use double lock nuts at each conduit termination. Use weather tight hubs in damp and wet locations. Sealing lock nuts shall not be used.

Grounding continuity to rigid metal conduit shall be accomplished by grounding bushings/adapters with lugs for connection to grounding counterpoise and/or grounding electrode conductor as defined by NEC.

All exposed wiring shall be run in not less than 1/2 inch (12 mm) galvanized rigid steel conduit. All conduits shall be installed to provide for drainage. Conduit shall be attached to wooden structures with galvanized

pipe straps and fastened with galvanized wood screws not less than No. 8 nor less than 1-1/4 inches (31 mm) long. There shall be at least two fastenings for each 10-foot (3 m) length.

Existing ducts may require clearing before use. It is the responsibility of the Contractor to locate the existing ducts, identify empty or partially empty conduits and clear the conduits as required. Where new cable is to be installed in existing duct, the full length of the duct shall be cleared of debris by mechanical means before the installation of the new cable. Acceptable methods of clearing existing ducts include "hydro-jetting" and "roto-rooting." All existing cables in each re-used duct shall be replaced for the length of the duct and properly spliced in a method approved by the Engineer. Clearing of existing duct banks or conduits is incidental to the cable pay item.

Dedicated ground rods shall be installed and exothermically welded to the counterpoise wire at each end of a duct bank crossing under pavement.

For concrete markers, the impression of letters shall be done in a manner, approved by the Engineer, to effect a neat, professional appearance. The letters shall be stenciled neatly. After placement, all markers shall be given one coat of high-visibility aviation orange paint, as approved by the Engineer.

Existing concrete markers or survey pins for runway thresholds, duct/conduit/cable/splice markings, utility line markings, taxiway points of tangency markings, or other similar items shall be removed and reinstalled or replaced, depending on the project work requirements, as required by a registered professional surveyor to the satisfaction of the Owner and the Engineer.

300-3.6 JUNCTION BOXES AND CONCRETE STRUCTURES.

Junction cans shall have both internal and external ground lugs. Size (diameter) and depth shall be as specified in the plans.

Galvanized cans shall have an external ground lug for mechanical connection/bolting ground clamps bonding.

For concrete structures, each cover and frame shall be galvanized and have a spring assisted, latching mechanism allowing one individual to open the manhole hinged cover(s) using the recessed lifting handles. Covers shall be secured by stainless steel penta-head bolts.

For manholes and handholes, cables shall be well supported on the walls using heavy-duty non-metallic cable racks with multiple arms per stanchion and wide type wire ties for securing the cables. Handholes shall have at least one stanchion on each wall and manholes shall have at least two stanchions on each wall. Adjustable arms shall lock into the stanchion. Stanchion and arm lengths shall be appropriate for the manhole or handhole size and the amount of cables to be supported. At least one spare unused arm stall be installed at each stanchion position. Stainless steel hardware shall be used to securely mount and secure the cable racks to the walls.

Handhole covers shall have custom legends. Coordinate exact text with the Engineer during product submittal reviews.

300-3.7 BACKFILL, COMPACTION, AND RESTORATION. Refer to the backfill, compaction and restoration requirements within Item P-152 where other compaction requirements are specified (under pavements, embankments, etc.)

Trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Backfilling from two directions will not be allowed. No backfilling will be accomplished without the approval of the Engineer or Construction Observer. The Contractor shall ensure all trenches are

inspected prior to being covered and prior to encasement. Any uninspected trenches which are prematurely covered shall be exposed for inspection at the Engineer and Owner's convenience at no additional cost to the Owner. The Construction Observer will coordinate with the Contractor for advance scheduling of trench inspection.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

All concrete/asphalt pavement removal and repair work shall be installed as separate pay items in accordance with Specification P-101 Surface Preparation.

The subgrade below the removed pavement shall be compacted to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D2922. Subgrade preparation will not be measured for separate payment, but will be considered subsidiary to Specification P-101 Surface Preparation.

300-3.8 CABLE AND UTILITY COORDINATION. The existing and the proposed locations of lighting cable are approximate. The Contractor shall be responsible for field locating and identifying the existing lighting circuits to determine their exact routing. The Contractor shall also be responsible for maintaining the lighting systems in a working condition until the new lighting circuits have been installed and tested. The Contractor shall proactively and expeditiously accomplish this cable identification work prior to performing any modifications to the lighting circuits. Coordinate identification work with the Owner and Engineer and make all corrections, additions, etc. on the as-built drawings.

Underground cable and utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these cables and utilities on the Plans. All existing cable and utilities may not be shown on the Plans and the location of the cables and utilities shown may vary from the location shown on the Plans. Prior to beginning of any type of excavation, the Contractor shall contact the utilities, the airport maintenance staff, FAA field personnel and other organizations as required and make arrangements for the location of the utilities on the ground. The Contractor shall maintain the cable and utility location markings until they are no longer required.

The Contractor shall replace or repair any underground cable or utility that has been damaged by the Contractor during excavation to the satisfaction of the owner of the cable or utility at no additional cost to the Owner.

Specific work construction and utility cutover coordination meetings shall be held with the FAA, concerning the utility line relocation work associated with their equipment and facilities. New work including handholes, pull boxes, underground ducts/conduits, and appurtenances required shall meet the respective utility standards and be installed to the satisfaction of the utility owner and the Engineer.

300-3.9 WIRING. The Contractor shall furnish all labor and materials and shall make complete electrical connections in accordance with the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electrical Code.

Provide color coding for phase identification.

Colors for 240/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Neutral: White

Colors for 208Y/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Phase C: Blue
d. Neutral: White

Colors for 480Y/277V Circuits:

a. Phase A: Brown
b. Phase B: Orange
c. Phase C: Yellow
d. Neutral: Gray

All new electrical cable shall be marked using color-coded plastic electrical tape which is specifically designed for application on polyethylene-jacketed cable. The tape shall be applied as detailed on the Plans. Marking tape shall be Scotch 35 Vinyl Plastic tape or approved equal.

300-3.10 5 kV CABLE CONNECTIONS.

Cable splicing/terminating personnel shall be licensed electricians who have the minimum continuous experience in terminating/splicing medium voltage cable as listed in Item L-108. The qualifications for these airfield lighting cable splicers shall be submitted for review and approval by the Engineer prior to any work. The Engineer may request sample splices be performed in his presence by the proposed personnel to clearly demonstrate that they have the skill and experience to perform this work. Connector kits and cables shall be provided in sufficient quantity by the Contractor in demonstrating these qualifications at no additional cost to the Owner.

Field-attached plug-in splices using FAA certified L-823 plug and receptacle connector kits, properly sized to the cable being used, shall be installed as shown in the plans. This work shall include the taping and heat shrinking. Refer to Item L-108 for additional requirements.

As an option, the Contractor may utilize enhanced FAA certified L-823 connector kits, such as the Amerace 54Super Kit. These kits do not require taping or heat shrinking. These kits shall be installed in accordance with the manufacturer's installation requirements. Note that the mixing of connector kits is unacceptable. The Contractor shall clearly list and submit the connector kits he proposes to utilize on the project for approval prior to any field construction work, and he shall only install that type during construction unless otherwise noted by the Engineer.

300-3.11 MARKING AND LABELING. Properly identify all electrical equipment.

Wire/Cable Designation Tape Markers:

a. Indoor Dry Locations: UL Recognized Materials, vinyl or vinyl-cloth, self-adhesive, wraparound, self-laminating, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-427 with thermal transfer print type, or approved equal.

b. Outdoor Locations and Indoor Wet and Damp Locations: White polyolefin, non-adhesive, full circle, heat-shrinkable sleeve, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-342 with thermal transfer print type, or approved equal.

Properly identify all electrical equipment, including but not limited to the following:

a. Switchgear, switchboards, and control panels.
b. Main distribution panel and individual devices within it.
c. Panelboards and individual devices within it.
d. Safety switches and disconnects.
e. Contactors and lighting control center, including all branch circuits.

f. Individually mounted circuit breakers.

Use permanently attached black phenolic plates with 3/8" white engraved lettering on the face of each, attached with minimum two sheet metal screws. Starters and relays connected under this Specification shall be identified whether furnished under this Specification or under other Specifications of this contract. Plates shall be indoor or outdoor rated as required by installation location.

Panelboard identification plates shall indicate panel by identification name, voltage system, ampacity rating and type, AIC rating, and feeder source description.

Identify each receptacle, light switch, junction box, etc. with panelboard identification and circuit number. For all wiring device covers, use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

Identify fire alarm junction boxes with red covers and mechanical control junction boxes with blue covers.

Install all identification as required by current adopted editions of the NFPA 70 - National Electrical Code and NFPA 70E - Standard for Electrical Safety in the Workplace.

300-3.12 REMOVAL AND RELOCATION OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated on the Plans. Any equipment which is damaged during the removal operation shall be subject to a reduction in payment for removal of the equipment. All equipment which is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

The Contractor shall carefully relocate existing equipment as indicated in the Plans. Any equipment that is damaged during the relocation operation shall be replaced at no additional cost to the Owner.

Any existing electrical equipment, conduit, cables, etc. that is damaged during construction shall be replaced at no additional cost to the Owner to the satisfaction of the Owner and the Engineer.

300-3.13 CERTIFICATION AND PERFORMANCE. Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-3.14 AS-BUILT DRAWINGS. Before work is started, the Contractor shall obtain at his expense one (1) full-sized set of prints for As-Built records; the Engineer will supply the tracings at printing cost to the Contractor.

The Contractor shall locate all underground and concealed work, identifying all equipment, conduit, circuit numbers, motors, feeders, breakers, switches, and starters. The Contractor will certify accuracy by endorsement. As-Built drawings shall be correct in every detail, so Owner can properly operate, maintain, and repair exposed and concealed work.

The As-Built drawings shall indicate all control system labeling and marking.

The Contractor shall store the As-Built drawings on the site. Drawings shall not be rolled. Make corrections, additions, etc., with pencil, with date and authorization of change.

As-Built drawings must be submitted to Engineer before project will be accepted.

Minor deviations from the Plans and Specifications shall be as approved by the Engineer.

Upon completion of the installation, the Contractor shall adjust the systems to the satisfaction of the Engineer.

300-3.15 TESTING.

General Electrical Testing: Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification and certify compliance with test parameters. Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest. Perform infrared scan tests and inspections of service and power distribution equipment at the respective hangars and provide reports. Electrical equipment will be considered defective if it does not pass tests and inspections. Reports shall include notations of deficiencies, remedial action taken and observations after remedial action.

System and Equipment Testing: All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Airport lighting equipment and special systems shall be tested in accordance with applicable FAA Advisory Circular requirements and the manufacturer's installation instructions. These tests shall also include those system requirements listed within AC 150/5340-26 Maintenance of Airport Visual Aid Facilities.

Test equipment and instruments utilized by the Contractor shall have been calibrated following the manufacturer's recommended schedule to verify their accuracy prior to performing the testing work. The Contractor shall provide instrument calibration certificates on test equipment when requested by the Engineer. Retesting work due to inaccurate or defective instruments shall be performed by the Contractor to the satisfaction of the Engineer at no additional cost to the Owner.

a. Regulator Calibration:

The Contractor shall check and calibrate both new and existing regulators utilizing the enclosed "Constant Current Regulator Calibration Report". Refer to the material section on constant current regulators for additional requirements.

New regulators are calibrated at the factory prior to shipping, while existing regulators typically need checks and calibrations on a routine basis so that they do not get out of tolerance. The intent is to check and/or calibrate these regulators using a high accuracy meter prior to energizing and placing the airfield lighting system in service.

Utilize a high accuracy true RMS ammeter with high accuracy clamp-on current probe when making these measurements (use round type probes, accuracy + or – 2% required, sized per the cable diameter and circuit ampacity to achieve the best accuracy). Adjust regulators per manufacturer's instructions to meet the output currents on each brightness step as listed in Tables 5-2 and 5-3 in AC 150/5340-26.

b. Megger Testing:

The Contractor shall perform megger testing on each existing regulator circuit prior to any work on the electrical system. This information shall be recorded and documented by the Contractor and submitted to the Engineer. The Contractor shall perform megger tests on each regulator circuit after the acceptance test period. This acceptance test information shall be recorded and documented by the Contractor and submitted to the Engineer. Megger test shall be performed in accordance with the requirements of Item L-108.

The Contractor shall submit his initial megger test reports on the enclosed "Insulation-Resistance Test Report" form prior to any work on the electrical system. This report shall be submitted to the Engineer and approved by the Owner prior to Contractor proceeding with his work.

After final acceptance testing has been completed, the Contractor shall complete and submit his final megger test reports to the Engineer and insert copies of the initial and final megger test reports in the Operation and Maintenance Manuals.

Megger testing shall be performed using an insulation meter, such as a Fluke 1507 Insulation Resistance Multimeter, Ideal 61-797 Digital Insulation Meter, or approved equal having an insulation test range up to 10 Gigohms or greater.

Insulation resistance testers for 5kV series circuits shall utilize the 1000V DC source output for testing. The test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

The Contractor shall be responsible to maintain an insulation resistance equal to minimum 80% of the initial testing value through the end of the contract warranty period. This requirement is based on AC 150/5340-26C which states that resistance values inevitably decline over the service life of the circuit and that a 10-20 percent decline per year is considered normal. Note that AC 150/5340-26C cancels AC 150/5340-26B; thus refer to the current edition of the maintenance AC for requirements in this project.

For existing circuit insulation resistance requirements, refer to "Existing Circuits" section of Item L-108.

The insulation resistance to ground for 600V rated cables shall be not less than 100 Megohms when measured per NETA standards.

The installations shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings in accordance with manufacturer's requirements. Testing equipment shall be furnished by the Contractor.

c. Ground Rod Impedance Testing:

The enclosed "Ground Rod Impedance Test Report" form shall be used and testing shall be performed in the presence of the Engineer.

As-Built drawings shall indicate the location of all installed ground rods. Each ground rod shall have a unique identifier that corresponds with its submitted ground impedance test report.

Three-pole fall-of-potential testers that can measure the ground resistance of a ground rod using auxiliary electrodes (staked testing), such as a Fluke 1621 Earth Ground Tester, shall be used for testing individual dedicated equipment ground rods at fixtures

and equipment, or for testing isolated counterpoise ground rods not yet connected to the counterpoise wire.

Clamp-on testers that can measure the ground resistance of a ground rod without using auxiliary ground rods (stakeless testing), such as a Fluke 1630 Earth Ground Clamp Meter or approved equal, shall be used for testing counterpoise ground rods which have already been connected to the counterpoise wire, or ground ring ground rods which have already been connected to the established ground ring system.

Ground impedance test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

If the ground rod's impedance exceeds 25 ohms, an additional rod shall be driven in a location suitable and approved by the Engineer. However, the additional rod must satisfy the requirements of NEC 250.53 and not be less than 6 feet away from any other ground rod electrode. Additional ground rods shall not be measured for separate payment but shall be considered subsidiary to the counterpoise or respective equipment pay item.

The Contractor shall perform additional tests if required and requested by the Engineer at no additional cost.

The Contractor shall coordinate with the resident Engineer to approve tests daily before proceeding. The Contractor shall fill out a separate test report for each date. Test reports shall be submitted weekly to the Engineer.

300-3.16 INSPECTION FEES AND PERMITS. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

300-3.17 WORK SUPERVISION.

State of Texas: The electrical contractor (whether the general contractor or a subcontractor) shall be a licensed contractor in the state of Texas having an electrical classification suitable for performing the work required in these contract documents.

The Contractor shall designate in writing the qualified electrical supervisor who shall provide supervision to all electrical work on this project. The minimum qualifications for the electrical supervisor shall be a master electrician as defined by the Texas Electrical Safety and Advisory Board. The supervisor or his appointed alternate possessing at least a journeyman electrician license shall be on site whenever electrical work is being performed. The qualifications of the electrical supervisor shall be subject to approval of the Owner and the Engineer.

All master and journeyman electricians shall be licensed in accordance with Texas Board Requirements. The website located at http://www.license.state.tx.us publishes the text of this statutory requirement. No unlicensed electrical workers shall perform electrical work on this project. Apprentice electricians in a ratio of not more than one apprentice per journeyman electrician will be allowed if the apprentices are licensed and actively participating in an apprenticeship program recognized and approved by The State of Texas.

Refer to specification section L-108-2.5 "Splicer Qualifications" for additional requirements.

300-3.18 TRAINING. The training classes shall be coordinated with the Owner and Engineer in advance of the final acceptance testing. Comprehensive operational and maintenance training materials shall be provided by the equipment manufacturer and the Contractor (see section 2.3 OPERATION AND MAINTENANCE DATA).

a. Operations and Maintenance:
   (1) Amount and length: 3-4 hours
   (2) Class size: 3-4 employees
   (3) Location: GA Terminal.
   (4) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (5) Training materials: O&M Manuals
   (6) Provide hands on troubleshooting specifics.

b. Preventive Maintenance Program Recommendations
   (1) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (2) Discuss failure scenarios and what to do.
   (3) Provide technical assistance points of contact and phone numbers.

Schedule the training with the Owner at least 10 days in advance and notify the Engineer.

Provide hands-on demonstrations and training of equipment components and functions, including adjusting, operating and maintaining the lighting equipment and systems. Coordinate the training schedule with the Owner in advance, so that the Owner may record the training if desired. Provide 4-hours training for the operational personnel and 4-hours training for the maintenance personnel.

METHOD OF MEASUREMENT

300-4.1 The quantity of lockout/tagout and constant current regulator calibration procedures to be paid for shall consist of all lockout/tagout procedure work and all constant current regulator calibration work completed in place, accepted and ready for operation. This item does not include measurement for constant current regulator equipment.

300-4.2 Temporary conduits shall be measured by the linear feet (meter) of conduits installed, including strapping for securing to pavement or turf, flagging, connections to existing stake or base mounted lights, and for pressure treated lumber used to protect the conduit where it crosses a vehicular access, all measured in place, completed, and accepted.

BASIS OF PAYMENT

300-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures – per Lump Sum
Item SS-300-5.2	Non-Encased, Schedule 80 PVC Conduit, 1-Way 1"C, Mounted to Surface for Temporary Electrical Connection – per Linear Foot

MATERIAL REQUIREMENTS

Fed.Spec.J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)

Fed. Spec. W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid
Fed. Spec. W-P-115	Panel, Power Distribution
Fed. Std. 595	Colors
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514	Fittings for Conduit and Outlet Boxes
Underwriters Laboratories Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
CFR 1910	Occupational Safety and Health Regulations
CFR 1926	Safety and Health Regulations for Construction
ANSI/IEEE C2	National Electrical Safety Code
NFPA 70	National Electrical Code (NEC)
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
29 CFR 1910	Occupational Safety and Health Standards (OSHA)
29 CFR 1926	Safety and Health Regulations for Construction
Jaquith Industries, Inc.	The Design, Installation, and Maintenance of In-Pavement Airport Lighting

FAA ADVISORY CIRCULARS

AC 150/5300-13	Airport Design
AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821 Panels for Control of Airport Lighting

AC 150/5345-5	Specifications for Airport Lighting Circuit Selector Switch
AC 150/5345-7	Specification for L-824 for Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Standard for Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853 Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Base and Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Taxiway and Runway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Isolation Transformers for Airport Lighting Systems
AC 150/5346-49	Specification L-854, Radio Control Equipment
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program
AC 150/5345-56	Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

END OF ITEM SS-300

CONSTANT CURRENT REGULATOR CALIBRATION REPORT

Standard Requirements: FAA AC 150/5340-26 (latest edition) Maintenance of Airport Visual Aid Facilities

Owner / Sponsor: _____ Engineer: Garver, LLC

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date: _____

Weather / Site Conditions: _____ Last Two Weeks of Rain: _____ inches

Constant Current Regulator #: _____ Serves: _____

	Completed	Comments
1. Check all control equipment for proper operation.	☐	_____
2. Perform short-circuit test. Record results and recalibrate if necessary.	☐	_____
3. Perform open-circuit test on regulators with open circuit protection. Open circuit protective device should de-energize the regulator. Record results.	☐	_____
4. Check and record regulator input voltage and current.	☐	_____
Input Voltage: _____ Input Current: _____		
5. Check and record regulator output load. (ONLY if regulator has monitoring package)	☐	_____
Volt-Amperes: _____		
6. Check and record output current on each brightness step. If output current is outside of the allowable range, adjust the regulator's on-board potentiometer to re-calibrate the output current within the allowable range. Re-record the new output current on this form.	☐	_____

3-Step CCR			5-Step CCR				
B10: _____	B30: _____	B100: _____	1: _____	2: _____	3: _____	4: _____	5: _____
Nominal: 4.8A	5.5A	6.6A	2.8A	3.4A	4.1A	5.2A	6.6A

Tested By: _____ (Signature and Date)

Test Equipment: _____ (Manufacturer and Model No.)

Engineer Witness: _____ (Signature and Date)

Owner / Sponsor Witness: _____ (Signature and Date)

INSULATION RESISTANCE TEST REPORT

Owner / Sponsor: _____ Engineer: Garver, LLC _____

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date Initial / Final Tests: _____

Weather / Site Conditions (Initial Test): _____ Last Two Weeks of Rain:_____inches

Weather / Site Conditions (Final Test): _____ Last Two Weeks of Rain:_____inches

		Initial Test Results		Final Test Results	
	Circuit Designation and Color Code	Regulator Size (kW)	Megger Reading Before Field Work (Megohms)	Regulator Size (kW)	Megger Reading After Field Work (Megohms)
1					
2					
3					
4					
5					
6					
Tested By:					
Test Equipment:					
Engineer Witness:					
Owner/Sponsor Witness:					

Provide signature/date and manufacturer/model no. as required in the fields above.

Initial Test Record – Owner Disposition

Owner / Sponsor: _____ (Signature and Date)

Check one only: ☐ Proceed with Installation ☐ Hold

GROUND ROD IMPEDANCE TEST REPORT

Owner / Sponsor: _____ Engineer: Garver, LLC _____

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Date: _____ Weather / Site Conditions: _____

Fall-of-Potential Style Tester (F):
Manufacturer: _____ Model #: _____

Clamp-On Style Tester (C):
Manufacturer: _____ Model #: _____

Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)	Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)

Tested By:	
Engineer Witness:	

Provide signature/date in the fields above.

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CABLE PULLING TENSION VALUES LOG

Owner / Sponsor: _____

Airport: _____

Project Title: _____

Date: _____

Dynamometer Manufacturer/Model #: _____

Engineer: Garver, LLC

Contractor: _____

Garver Project Number: _____

Weather / Site Conditions: _____

Cable / Wire Manufacturer: _____

From / To Locations	Wire/Cable Size	Length of Pull	Pull Method	Maximum Value	Measured Value
Tested By:					
Engineer Witness:					

Provide signature/date in the fields above.

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ITEM SS-301 ELECTRICAL DEMOLITION WORK

DESCRIPTION

301-1.1 This item shall consist of the removal and satisfactory disposal of existing runway and taxiway edge lights, in-pavement lights, guidance signs, markers, manholes, handholes, junction structures, racks, pads, equipment, poles, towers, shelters, and other incidentals, all of which are not designated or permitted to remain, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. This work shall include the removal of indicated equipment, materials, and incidentals necessary for a complete item removal, including all restoration work, as a completed unit to the satisfaction of the Engineer.

Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

301-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

MATERIALS

301-2.1 All backfill and repair materials used in electrical demolition, repair and restoration work shall comply with the referenced specifications and be approved by the Engineer.

Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

CONSTRUCTION METHODS

301-3.1 GENERAL. No demolition shall be started until the removal and/or relocation work has been laid out and approved by the Engineer. All material shall be disposed of off-site. All hauling and disposal will be considered a necessary and incidental part of the work. Hauling cost shall be considered by the Contractor and included in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor shall remove all existing underground cable, which is unused or rendered unusable by this project, when such is exposed or made accessible during the course of this work. All such wiring removed shall become property of the Contractor and shall be immediately removed from the project. Wiring in conduit shall be removed as indicated or if new wiring is shown to be installed in its place. Existing wiring shall not be reused or reinstalled.

Wiring not exposed shall be abandoned in place, if a reasonable effort will not remove it. No measurement or payment will be made for this cable removal work. Damage to turf or other systems will not be permitted in order to salvage or retrieve existing cable.

Any damage to electrical equipment, systems, structures, conduits, cables, and accessories or other utilities, designated to remain in place, shall be repaired or replaced expeditiously at no additional cost to the Owner and to the satisfaction of the Owner and Engineer.

Holes, ditches, or other abrupt changes in elevation caused by the removal operations that could obstruct drainage or be considered hazardous or unsightly shall be backfilled, compacted, and left in a workmanlike condition.

Trenches or voids resulting from the removal or demolition of existing electrical equipment or other structures shall be filled with approved material placed in layers in accordance with Item P-152.

Concrete foundations and pads to be removed shall be obliterated full depth.

301-3.2 REMOVAL AND/OR RELOCATION OF LIGHT FIXTURES AND EQUIPMENT. Light fixtures and other equipment which are to be removed shall be carefully excavated. All concrete bases and concrete anchors shall be removed by the Contractor. The removed lights, guidance signs, isolation transformers and wiring harnesses shall then be given to the Owner, or properly disposed of if so directed by the Owner. The ground in the area of the removed lighting equipment shall be backfilled and properly compacted. Light fixtures and equipment which are to be relocated shall be stored on site and reinstalled with new lamps, new transformers, and all other new required accessories as indicated in the plans.

301-3.3 REMOVAL OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated in the plans. Any equipment that is damaged during the removal and/or relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment. All equipment that is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

Any equipment that is damaged during the relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment.

Any equipment that is damaged during the relocation operation shall be repaired or replaced by the Contractor at his expense to the satisfaction of the Owner and Engineer.

METHOD OF MEASUREMENT

301-4.1 The quantity of existing wind cones, removed, to be measured under this item shall be the number of wind cones removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.2 The quantity or existing segmented circle marker systems, removed, to be measured under this item shall be the number of segmented circle marker systems removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.3 The quantity of existing lights or guidance signs, removed, to be measured under this item shall be the number of each complete unit removed, and accepted by the Engineer.

This item shall include removing and storing the existing equipment as directed by the Engineer.

Where the light base and concrete structure are indicated to be removed or demolished, the item shall include restoring the area to match existing, including removing the complete concrete item, filling and tamping all holes with earth, and clearing and leveling the site.

Where the light base and concrete structure are to remain, a new blank cover shall be installed for protecting the light base during the construction work. Blank covers shall be removed when the existing equipment is reinstalled and given to the Owner after completion of construction work in the respective area.

BASIS OF PAYMENT

301-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-301-5.1	Existing Concrete Encased, 2'Wx2'L Electrical Handhole, Removed – per Each
Item SS-301-5.2	Existing Concrete Encased, 3'Wx3'L FAA-Style Electrical Handhole, Removed – per Each
Item SS-301-5.3	Existing Stake Mounted Edge Light, Removed – per Each
Item SS-301-5.4	Existing Base Mounted Edge Light, Removed – per Each
Item SS-301-5.5	Existing Base Mounted Edge Light, Removed, Base to Remain – per Each
Item SS-301-5.6	Abandoned Wind Cone Base, Removed – per Each
Item SS-301-5.7	Existing Wind Cone and Foundation, Removed – per Each
Item SS-301-5.8	Existing Segmented Circle Marker System, Removed – per Each
Item SS-301-5.9	Abandoned Sign Base, Removed – per Each
Item SS-301-5.10	Existing Base Mounted Guidance Sign, Removed – per Each
Item SS-301-5.11	Existing Base Mounted Guidance Sign, Removed, Base to Remain – per Each
Item SS-301-5.12	Concrete Encased Duct Bank Removal – per Linear Foot

END OF ITEM SS-301

ITEM SS-305 DIRECTIONAL BORING

DESCRIPTION

305-1.1 This item shall consist of furnishing and installing conduits via directional boring methods, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The borings shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. It shall also include all trenching, backfilling, mandreling installation of drag wires and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of conduit and/or cables, to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

305-2.1 GENERAL. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

All equipment and materials covered by these specifications shall be new and meet applicable manufacturer's standards.

Polyethylene conduits shall conform to SDR 11 type.

The Contractor shall submit a statement of qualifications including previous similar jobs experience in directional boring for the last three (3) years. Previous job description work shall include length, pipe type, pipe size(s) and soil type,

The Contractor shall submit complete shop drawings outlining his directional boring method (including drilling fluids, additives and mixtures), drill rod, bore size, materials, equipment and safety requirements to be utilized on this specific project, for review and approval by the Engineer.

All materials shall be inspected at the job site for damage. Defective materials shall be removed from the job site and replaced with new materials prior to the work.

CONSTRUCTION METHODS

305-3.1 GENERAL. Boring shall be done by pilot hole method using fluid as a lubricant only and shall not undermine the surrounding ground. Jetting will not be permitted. The Contractor shall use a guidance system to assure knowledge of the bore location while making the bore. The Contractor will not be paid for unusable sections.

Locate and clearly mark all utilities prior to start of excavation or drilling. The Contractor will be responsible for damage to pavements, utilities, or other structures caused by his activity. The Contractor shall repair, at his own expense, any damaged pavement, utility, or other structure as directed by the Engineer or the owner of the utility or structure. The Contractor shall not excavate to find a bored casing without specific approval and definitions of limits. No payments will be made for excavation and repair except as shown on drawings.

The Contractor shall inspect the locations where the encasement structures are to be installed and familiarize himself with the conditions under which the work will be performed and with all necessary details for orderly prosecution of the work. The omission of any details in the Plans and herein for the satisfactory installation of the easement in its entirety shall not relieve the Contractor of full responsibility for the installation.

Directional bores shall be a minimum 48" below the existing base. For this project, the existing pavement shall be considered 12" in depth and the existing base shall be considered 12" in depth. Therefore, the overall depth shall be a minimum 72" below the surface of the pavement. The Contractor shall utilize a beacon or other depth reading instrument to verify the depth below the runway.

The bore size shall be the minimum size for the work required. Upsizing the bore will not be allowed.

The Contractor shall utilize a walkover guidance and tracking system to assure the orientation and depth of the bore path. Depth and orientation confirmation shall occur at a minimum of every five feet of lateral distance covered.

The Contractor shall perform all excavation required to complete the work regardless of the material encountered. Excavation from the access shafts (bore pits) in excess of the required to backfill the access shafts and open ditch portion of the line shall be disposed of by the Contractor off of Airport Property.

Pits and trenches shall be constructed and maintained in accordance with the current edition of the OSHA Standard for Excavating and Trench Safety Systems. Restore ground to original conditions after work completion including seeding and topsoiling.

The access shafts (bore pits) for encasement installation shall be rectangular in plan view with the longest dimension being constructed with the direction of the pipe. The access shafts shall be constructed at a location shown on the plans.

Use a high quality drilling fluid to ensure hole stability, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Use only fluid with a composition which complies with all federal, state and local environmental regulations. Mix the drilling fluid with potable water (of proper pH) to ensure no contamination is introduced into the soil during the drilling, reaming, or pipe installation process. The Contractor is responsible for any required pH adjustments.

Disposal of the drilling fluids is the responsibility of the Contractor. Conduct disposal in accordance with all relative environmental regulations and permit requirements. No excess drilling fluids shall remain in the bore access pit or receiving pit. Immediately clean up any drilling fluid spills or overflows from these pits. All excess drilling fluids and mud shall be disposed of off Airport Property on a daily basis. Bore pits and trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Assemble the entire pipe to be installed via directional boring prior to starting pull back operations. Support the pipe to enable it to move freely and prevent damage. Install the pipe in one continuous pull. Maximum allowable tensile force imposed on the pull section is not to exceed 90 percent of the pipe manufacturer's safe pull strength. If multiple pipe sizes or materials, the lowest safe strength shall govern. Damaged pipes shall be replaced at no additional cost to the Owner.

Extend and connect pipes to junction structures as indicated. When pipe is used as a sleeve, install interior conduits as indicated and terminate the conduits with end bells as shown in the plans or as required.

Upon completion of the work, immediately remove all debris from the job site and restore the areas to original condition acceptable to the Engineer.

The Contractor shall record and document drilling logs that provide drill bit locations, both horizontally and vertically. These records shall be submitted to the Engineer and included in the O&M manual for the project.

All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

METHOD OF MEASUREMENT

305-4.1 The quantity of directional boring to be paid for under this item shall be the number of linear feet of conduit and directional boring installed with backfill, compaction, turf restoration, and appurtenances, measured in place, completed and accepted to the satisfaction of the Engineer.

BASIS OF PAYMENT

305-5.1 Payment will be made at the contract unit price per linear foot for each type and size of directional boring completed by the Contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-305-5.1	Directional Boring, 2-Way 2"C Polyethylene Conduits – per Linear Foot

END OF ITEM SS-305

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ITEM SS-310 AIRPORT LIGHTING SYSTEMS

DESCRIPTION

310-1.1 This item shall consist of furnishing and installing airport runway and taxiway edge lighting systems, retroreflective markers, guidance signs, runway centerline and touchdown zone lighting systems, other taxiway lighting systems, and other approach lighting aid systems, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The system shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. This work shall include the furnishing of all equipment, materials, services and incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

310-1.2 Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

310-1.3 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

EQUIPMENT AND MATERIALS

310-2.1 GENERAL.

a. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

b. For pre-cast or prefabricated concrete encased light base installations, the Contractor shall submit and coordinate the construction of the proposed pre-cast units with the Engineer onsite to review and approve the construction process. The Contractor shall submit his proposed installation process for review and approval by the Engineer. The Contractor shall provide additional items and work if required and requested by the Engineer for the construction and installation of the pre-cast units at no additional cost to the Owner.

Pre-cast or prefabricated concrete encased light bases may only be assembled at the Contactor's staging area at the airport in order to allow the Engineer to check and approve all such construction items. Pre-cast bases assembled offsite will not be allowed.

c. For in-pavement fixture installations, the Contractor shall submit his proposed installation method and technique for correct placement and alignment of all lights for review and approval prior to any work.

In-pavement lighting systems will require an experienced electrical supervisor and experienced installation team, including licensed surveyor. This includes the complete installation, layout, and coordination with paving joints and paving work.

310-2.2 LIGHT FIXTURES. Airfield lights shall be supplied with all features and accessories including isolation transformers, light bases, base covers, safety ground rods, concrete pads and incidentals required for a complete installation as defined in these Specifications and as shown on the plans.

a. Medium Intensity Taxiway Lights (MITL):

(1) Taxiway edge elevated lights shall be L-861T(L), LED lamp, omnidirectional blue lens.

(2) Taxiway edge in-pavement lights shall be L-852T(L), LED lamp, Class 2, Style 3

(low profile), omnidirectional blue lens, mounted on a 12" diameter L-868B light base.

310-2.3 LAMPS. Lamps for elevated edge lights shall be LED type as specified.

310-2.4 SPARE EQUIPMENT INCLUDING LAMPS, FIXTURES, AND SPARE SIGN REPLACEMENT COMPONENTS. Provide 10 percent spare lamps of each type installed for lights and signs, minimum quantity of 6 required. Spare lamps shall not be measured for separate payment but shall be considered subsidiary to the light fixture and guidance sign pay items.

Provide 10 percent spare fixtures of each type installed for lights. Provide 10 percent spare sign replacement components of each type installed for signs. Spare fixtures and spare sign replacement components shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

Provide the following spare fixtures:

- 8 L-861T Taxiway Edge Lights
- 1 L-852T Taxiway Edge Ligbt
- 1 set of spare replacement components for a 2-Module, Size 2 L-858 guidance sign
- 1 set of spare replacement components for a 3-Module, Size 2 L-858 guidance sign

a. A spare elevated LED fixture unit shall be one complete, ready-to-install fixture, including the coupling, column, head housing assembly, cordset, LED power supply assembly, LED assembly, and lens assembly.

b. A spare in-pavement LED fixture unit shall be one complete, ready-to-install fixture, including the top cover assembly, bottom pan assembly, cordset, LED power supply assembly, and LED assembly.

c. A spare sign replacement component unit shall include the LED light tube assembly and LED power supply assembly.

The spare lamps, spare fixtures and spare sign replacement components shall be delivered and stored as directed by the Owner, with transmittal receipt signed by Owner's representative. A signed copy shall be forwarded to the Engineer with an additional signed copy placed in the O&M manuals.

310-2.5 GUIDANCE SIGNS. Guidance signs shall be L-858(L), meeting the criteria set forth in AC 150/5345-44, Specification for Taxiway and Runway Signs, and suitable for base mounting. Each unit shall be furnished with the required panels, mounting assemblies, frangible couplings, transformer, intensity control, identification tag, metal tethers, fasteners and safety ground rods.

Style 2 and Style 3 signs shall meet the luminance requirements in AC 150/5345-44 throughout the current ranges of the associated series circuit.

Guidance signs shall have an integral on/off switch for airport maintenance use.

Signs shall be furnished with permanent type nameplates that are both weather and sunlight resistant. Nameplates which are completed with ink markers or similar methods will not be accepted.

Refer to the guidance sign index in the Plans for information on each sign's size, style, class and mode.

The complete sign installation shall be designed to withstand a 200-mph wind load.

Guidance signs shall be Size 2 (15" Legend), Style 2 (3-step circuit), Class 1 (operation range from -4 degrees F to 131 degrees F), Mode 2 (withstand wind loads of 200 mph).

310-2.6 ISOLATION TRANSFORMERS. New isolation transformers shall be Type L-830 and have a

wattage rating suitable for the wattage of the fixture and sign lamps. The transformer shall be listed in FAA Circular AC 150/5345-47.

Provide 10 percent spare isolation transformers of each type installed for lights, signs and other equipment. Spare transformers shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

310-2.7 FIELD LIGHTNING ARRESTOR. New series circuit field lightning arrestors shall be installed on the airfield series circuits to reduce the risk of lightning damage to the circuits, including cables, isolation transformers and field/vault lighting equipment. The arrestor assembly shall consist of a NEMA 6P rated metal enclosure, using MOV components, rated for 5,000 volts continuous operating voltage with 25,000 A peak surge current, having a minimum 2 giga-ohm insulation resistance, with L-823 connectors, The arrestors shall be designed specifically for protecting 5 kV airfield series circuits and shall be manufactured by ADB, Astronics or Liberty Airport Systems.

Provide 10 percent spare lightning arrestor units, minimum quantity of 2. Spare arrestors shall not be measured for separate payment but shall be considered subsidiary to the respective arrestor pay items.

CONSTRUCTION METHODS

310-3.1 GENERAL. The installation and testing details for the lighting system shall be as specified in the applicable advisory circulars.

The Contractor is responsible for all surveying and measurement which is required to accurately position and aim airfield lighting systems and equipment.

Airfield lighting systems and equipment that are improperly installed shall be removed and re-installed correctly as directed by the Engineer. No payment will be made for the removal and reinstallation of airfield lighting systems and equipment improperly installed. All remedial work shall be to the satisfaction of the Engineer.

310-3.2 LIGHTING LAYOUT PLANS. The Contractor shall stake the airfield lighting systems, prior to installation of any trench, cable or lighting apparatus. The intent is to stake the installation at the locations indicated, noting any deviation from plan dimensions to the Engineer prior to installation. The Contractor shall obtain the services of an experienced and licensed surveyor to perform this work.

The Engineer shall provide electronic CADD files to the Contractor for this staking work. The Contractor shall stake the items and his surveyor shall provide a CADD file submittal back to the Engineer. Based upon this submittal, the Engineer shall coordinate and provide directions on any adjustments necessary to meet existing field condition requirements and comply with FAA Advisory Circular requirements on the layout and spacing of equipment.

The Contractor and his surveyor shall then make any electronic CADD file spacing adjustments and/or field staking adjustments prior to installation at no additional cost to the Owner.

Refer to General Provisions Section 50 Control of Work for additional construction layout and staking requirements.

310-3.3 PLACING THE EQUIPMENT. The equipment shall be mounted on concrete pads as shown in the plans. Secure the equipment and make all final connections.

310-3.4 MOUNTING, LEVELING, AND AIMING. The concrete support to which the equipment is fastened shall be accurately leveled before mounting the equipment. The units shall be properly aimed, as recommended by the manufacturer of the supplied equipment. This adjustment shall be accomplished using

factory-approved aiming devices and techniques.

310-3.5 PLACING LIGHTS. All equipment shall be installed at locations indicated in the plans. Lights shall be laid out by locating the two control points by station as indicated on the plans and measuring the indicated individual separation distances. Light bases shall be located within 1 inch +/- longitudinally and 0.5 inches +/- transversely of the location indicated unless deviation is approved by the Engineer. Excavation for installation of light bases shall be backfilled with at least 4 inches of granular leveling course, as approved by the Engineer. Fixture height shall be as indicated on the Drawings.

For pre-cast or prefabricated concrete encased light base installations, a leveling course of sand shall be placed in the bottom of the excavated hole, sufficient for accurately installing, leveling and placing the lights in accordance with the requirements in this specification and AC 150/5340-30. Concrete encased light bases shall be allowed to cure a minimum of 7 days prior to installation.

Utilize a bubble level device to level all light fixtures in the horizontal light plane during the day, and then check at night to ensure uniformity in light output.

Provide factory-approved alignment tools and aiming devices to properly level and align fixtures as required by the FAA Advisory Circulars and manufacturer's installation instructions. After all light fixture installations are completed and accepted by the Engineer, these alignment tools and aiming devices shall become property of the Owner and shall be delivered and stored as directed by the Owner.

310-3.6 PLACING SIGNS. All signs shall be installed at the approximate location indicated in the plans. The specific requirements for sign location are specified in AC 150/5340-18, Standards for Airport Sign Systems. Specific requirements of this AC are also shown on the Plans. Signs shall be located within 1 inch +/- longitudinally or 0.5 inches +/- transversely of the required location unless deviation is approved by the Engineer. The locations for the signs shall be staked by the Contractor and approved by the Engineer before installation begins.

Provide single module signs with one tether. Provide multiple module signs with a tether at both ends.

310-3.7 PLACING FIELD LIGHTNING ARRESTORS. All field lighting arrestors shall be installed at locations indicated in the plans, typically about every 2,000 feet around the series circuit. The arrestors shall be installed in base cans or handholes as noted on the plans. Provide a minimum #4 AWG copper ground wire to connect the arrestor ground lug to dedicated ground rod outside the base can or handhole on the pavement side of the equipment. This ground rod shall be connected to the counterpoise system using exothermic welds only. Provide a permanent type marker at each arrestor listing the date it was placed in service.

310-3.8 TRANSFORMER INSTALLATION. The transformer for base mounted fixtures shall be placed inside the base. The transformer for stake mounted fixtures shall be located uniformly as shown on the plans. The primary cable connections shall be made with L-823 connectors as described in Item L-108 and have 3 feet of slack cable. The secondary leads connected to the lamp leads by means of a disconnecting plug and receptacle provided with the unit, and this joint shall not be taped. The secondary joint shall be fastened with a holding ring provided for this purpose.

310-3.9 UNIT ASSEMBLY. All electrical equipment, including edge lights, guidance signs and other visual aid units shall be assembled in accordance with the manufacturer's installation procedures. Anti-seize compound shall be used on all screws, nuts, and threads, including frangible coupling threads. If coated bolts are used (ceramic metallic/fluoropolymer coating), then do not apply anti-seize compound.

Provide and install all spacers, shims, and gaskets as required, and verify they are in place before installing the light fixture on the base.

Bolts and washers for new and existing bases shall be new. Do not reuse existing hardware. The minimum thread engagement into top flange of the base shall be 0.5 inches.

For in-pavement light fixtures, provide Nord-Lock NL 3/8 stainless steel 2 part locking washers or approved equal, as required by the manufacturer.

Coordinate recommended torque values with the light fixture manufacturer, light base can manufacturer, stainless steel bolts and hardware used, and exact anti-seize compound used, in order to prevent light base thread damage. Utilize a dial-type torque wrench for accuracy and to prevent over-tightening bolts. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall submit complete installation method shop drawings and calculations to determine the proper torque requirements for review and approval by the Engineer prior to any field removal or installation work for in-pavement light fixtures.

When installing new or existing light fixtures on existing bases, the following work shall be performed for the removal and reinstallation work:

a. Remove all bolts including any that are frozen or broken. If necessary, drill out and tap for new bolt. If the can threads are galled but usable, clean threads with a tap.
b. Remove the light, base plate, transformer, and any foreign object that may be inside the can.
c. Remove the old cable, mandrel the conduits, and shop-vacuum out the can clean.
d. Install the new cable, connectors, transformer, gasket, bolts, and other required appurtenances per the fixture type and its location in accordance with FAA Advisory Circular requirements and manufacturer's requirements.
e. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall obtain complete installation manuals for the new airfield lighting equipment and the existing equipment to be reinstalled prior to any removal or installation work. Copies of these manuals shall be maintained in 3-ring binders within the Contractor's onsite field office.

In-pavement light fixtures that are installed too high will require their complete removal and reinstallation at no additional cost to the Owner. In-pavement fixtures shall be provided with all spacers, shims, gaskets and other appurtenances for complete installations that comply with FAA Advisory Circular requirements and manufacturer's installation instructions. All assemblies and work shall be to the satisfaction of the Engineer.

310-3.10 IDENTIFICATION NUMBERS. An identifying number shall be assigned to each light and sign in accordance with the plans or as approved by the Engineer and Owner. This number shall be imprinted with reflective black with 1/2" letters on a non-corrosive metal disc 2" minimum diameter and attached to the pavement side of the fixture with a metal screw.

310-3.11 TEMPORARY AIRFIELD LIGHTING. Refer to the Airfield Lighting Phasing Plans and Details for additional requirements. Existing lighting circuits shall remain operational by use of temporary circuits. New lighting circuits shall also be connected and remain operational by use of temporary circuits. This item shall include all work to maintain the existing and new lighting circuits during construction and allow all taxiways and runways in operation to remain lighted, including that portion through the construction area, as indicated in the Phasing Plans and as directed by the Engineer.

The Contractor shall perform initial field work including location and verification of existing circuits and submit plans for the temporary airfield lighting required in each work phase, for review and approval by the Engineer and Owner, prior to starting work of that phase. This work shall include megger testing of circuits and circuit segments before and after installation and connection of jumpers.

The Contractor shall install couplings and other required fittings/appurtenances in conduit systems at last pavement joint within each phase for connecting to conduit systems in the next phase, or for connecting to existing conduit systems to remain.

310-3.12 TESTING. The installation shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings as outlined in Item SS-300 and Item L-108. Testing equipment shall be furnished by the Contractor. Refer to Item L-108 for additional test requirements.

Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction.

All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

METHOD OF MEASUREMENT

310-4.1 The quantity of lights of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, base plates, gaskets, couplings, specified height columns, concrete bases, cables, connectors, safety ground rods, bolts/hardware, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare fixture requirements.

310-4.2 The quantity of guidance signs of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, concrete bases/pads, cables, connectors, safety ground rods, tethers, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare sign component requirements.

310-4.3 The quantity of field lightning arrestors, complete with arrestor, base, connectors, equipment safety ground rod, lightning arrestor ground rod, conductors, and all other required appurtenances, to be measured under this item shall be the number of each type installed, as completed units in place, ready for operation, and accepted by the Engineer.

310-4.4 Temporary airfield lighting shall be measured as a lump sum complete item per each respective phase work area, including all work completed in place and ready for operation, and including the installation, protection, and removal of all temporary cables, conduits, lighting, grounding, marking, and associated items and appurtenances, as indicated in the Drawings and as directed by the Engineer.

BASIS OF PAYMENT

310-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-310-5.1	L-858(L) Base Mounted, 2-Module Guidance Sign, Installed – per Each
Item SS-310-5.2	L-858(L) Base Mounted, 3-Module Guidance Sign, Installed – per Each
Item SS-310-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed – per Each
Item SS-310-5.4	L-852T(L) Low Profile Base Mounted In-pavement Taxiway Edge Light, Installed in Existing Pavement – per Each
Item SS-310-5.5	Field Lightning Arrestor, Installed – per Each
Item SS-310-5.6	Vehicle Sign Assembly, Installed – per Lump Sum

END OF ITEM SS-310

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ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. All reinforced concrete pipe shall be Class III pipe unless otherwise denoted on the plans. No pick-eye holes will be allowed.

701-2.2 PIPE. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 JOINT FILLERS. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets.

CONSTRUCTION METHODS

701-3.1 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical. *If subsurface conditions require, provide dewatering to carry out the work.*

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 BEDDING. The pipe bedding shall conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. Rigid Pipe. Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than *50%* ~~30%~~ of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least *50%*~~10%~~ of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be *number 57 stone as defined in ASTM C 33 or approved equal.* ~~sand or select sandy soil with 100% passing a 3/8 inch sieve and not more than 10% passing a No. 200 sieve.~~

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth	Minimum Bedding Depth
inch	inch
1/2	1
1	2
2	3
2-1/2	3-1/2

c. PVC, Polyethylene, and Polypropylene Pipe. For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 JOINING PIPE. Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal Pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, and Polypropylene Pipe. Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

701-3.5 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing *or* shall meet the requirements of Item P-153 *when called for in the Plans*. It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2 inch sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.

For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

When called for in the Plans, remove existing stormwater pipe by excavating, removing pipe, disposing of pipe in a manner consistent with local law and codes, and backfill of the excavation following Item P-152.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

701-4.2 *The length of pipe removed shall be measured in linear feet of pipe removed, backfilled, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, prior to removal, whichever is applicable.*

~~**701-4.2** The volume of concrete for pipe cradles shall be the number of cubic yards of concrete that is completed in place and accepted.~~

~~***701-4.2*** *The pipe end sections shall be measured for each complete unit installed in place, completed, and approved. Several classes, types and size shall be measured separately. All fittings and curtain walls shall be included as part of the item*~~

~~**701-4.3** The volume of rock shall be the number of cubic yards of rock excavated. No payment shall be made for the cushion material placed for the bed of the pipe.~~

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated; *and shall include all costs for excavation, dewatering, bedding, backfill and all other miscellaneous costs for installation of the pipe.* ~~at the contract unit price per cubic yard (cubic meter) of concrete for pipe cradles; and at the contract unit price per cubic yard for rock excavation.~~

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.2 *Payment will be made at the contract unit price per linear foot for removal of pipe of the type and size designated; and shall include all costs for excavation, dewatering, removal and disposal, backfill and all other miscellaneous costs for removal of the pipe.*

Payment will be made under:

Item D-701-1	18" Reinforced Concrete Pipe (Class III) – per Linear Foot

MATERIAL REQUIREMENTS

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains

ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

END ITEM D-701

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ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 BRICK. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 MORTAR. Mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole.

751-2.5 CORRUGATED METAL. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

a. ASTM A48	Gray iron castings
b. ASTM A47	Malleable iron castings
c. ASTM A27	Steel castings
d. ASTM A283	Grade D: Structural steel for grates and frames
e. ASTM A536	Grade 65-45-12: Ductile iron castings
f. ASTM A897	Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 STEPS. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

751-2.8 PRECAST INLET STRUCTURES. Manufactured in accordance with and conforming to ASTM C1433.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. *If subsurface conditions require, provide dewatering to carry out the work.* The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturb and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 BRICK STRUCTURES.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and Cold Weather Protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches . When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 CORRUGATED METAL STRUCTURES. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 INSTALLATION OF STEPS. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.9 BACKFILLING.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the Engineer. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit, completed and accepted.

751-4.2 Reinforcing steel shall not be measured for separate payment but shall be considered subsidiary to the structure in which it is contained.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; *dewatering*; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-1	4'X4' Single Grate Inlet (Heavy-Duty) - per Each
Item D-751-2	4'X4' Junction Box - per Each

MATERIAL REQUIREMENTS

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

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ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

101-1.2 Limits of pavement removal, pavement repair, joint and crack repair, paint and rubber removal, and cold planing are estimated in the plans. Actual limits of these items shall be coordinated with the Engineer prior to construction.

EQUIPMENT

101-2.1 All equipment shall be specified hereinafter or as approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 REMOVAL OF EXISTING PAVEMENT

a. Concrete Pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab, or all multi-layer slabs, 1 foot inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be sawcut the full depth of the pavement. The pavement inside the sawcut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

b. Asphalt Concrete Pavement. Asphalt concrete pavement to be removed shall be cut to the full depth to existing subgrade or soil around the perimeter of the area to be removed. This includes asphalt surfacing, underlying pavement courses, and aggregate base down to top of subgrade or soil. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. If the material is to be wasted on the airport site, it shall be broken to a maximum size as designated by the airport owner.

c. Disposal. All existing pavement removed shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its costs shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.

101-3.2 PREPARATION OF JOINTS AND CRACKS. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks, ignoring hairline cracks (<

1/4 inch wide) with a crack sealant per ASTM D6690. Cracks and joints wider than 1/4 inch and less than 1/2 inch shall be filled with a hot-poured joint sealing conforming to ASTM D 6690. Wider cracks (over 1-1/2 inch wide) along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled within 0 to 1/8 inches (0-3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

a. Soil Sterilants. Soil sterilants shall contain Bromacil or Prometone and shall be approved by the Engineer. Application rates shall be in accordance with the manufacturer's recommendations.

b. Crack Preparation. A high temperature compressed air lance shall be used at all times to blast out any vegetation, dirt, dampness and loose materials from the cracks. Existing crack sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. After cleaning of crack, tack coat shall be applied prior to the application of emulsified asphalt and aggregate.

c. Filler Application. After cracks have been cleaned, received soil sterilant and tack coat, and have been approved by the Engineer, the cracks shall be filled with the emulsified asphalt and aggregate described within this specification. The mix shall be raked in the crack by hand in order to completely fill the entire crack. Once the crack is filled, excess asphalt mix shall be rounded up along the length of the crack, and pinched into the crack using a small asphalt roller. The application and compaction method shall be approved by the Engineer prior to beginning crack cleaning operations.

~~**101-3.3 REMOVAL OF PAINT AND RUBBER.** All paint and rubber over one foot wide that will affect the bond of the new overlay shall be removed from the surface of the existing pavement. Chemicals, high-pressure water, heater-scarifier (asphaltic concrete only), cold milling, or sandblasting may be used. Any methods used shall not cause major damage to the pavement. Major damage is defined as changing the properties of the pavement or removing pavement over 1/8 inch deep. If chemicals are used, they shall~~

comply with the state's environmental protection regulations. No material shall be deposited on the runway shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 CONCRETE SPALL OR FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.

a. Repair of Concrete Spalls in Areas to be Overlaid with Asphalt. The Contractors shall repair all spalled concrete as shown on the plans or as directed by the Engineer. The perimeter of the repair shall be sawcut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphaltic concrete with a minimum Marshall stability of 1,200 lbs. and maximum flow of 20 (units of 0.01 in). The material shall be compacted with equipment approved by the Engineer until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphaltic Concrete Pavement Repair. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. The base course and subbase shall be replaced if it has been infiltrated with clay, silt, or other material affecting the load-bearing capacity. Materials and methods of construction shall comply with the other applicable sections of this specification.

101-3.5 COLD MILLING. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a finished surface that provides a good bond to the new overlay. The milling machine or grinder shall operate without tearing or gouging the under laying surface. The milling machine or grinder shall be equipped with automatic grade and slope controls. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material that was removed with new material at no additional cost to the Owner.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Contractor Engineer shall layout the area to be milled with a straightedge in increments of 1 foot widths. The Contractor's layout shall be approved by the Engineer prior to beginning milling operations. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, Grade Correction, or Surface Correction. The milling machine shall have a minimum width of [7] feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade and tolerances specified. The machine shall cut vertical edges. A positive method of dust control shall be provided. The machine shall have the ability to windrow the millings or cuttings**or** remove the millings or cuttings from the pavement and load them into a truck.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove any remaining aggregate or fines.

101-3.6 PREPARATION OF ASPHALT PAVEMENT SURFACES. Existing asphalt pavements indicated to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt concrete similar to that of the existing pavement in accordance with paragraph 101-3.4.

~~b. Repair joints and cracks in accordance with paragraph 101-3.2.~~

~~c. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.~~

~~d. Clean pavement surface immediately prior to placing the surface treatment by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.~~

101-3.7 MAINTENANCE. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 PREPARATION OF JOINTS IN RIGID PAVEMENT.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning Prior to Sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than three inches from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

~~**101-3.9 PREPARATION OF CRACKS IN FLEXIBLE PAVEMENT.**~~

~~**101-3.9.1 Preparation of Crack.** Widen crack with router random crack saw by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, joints will be blown out with a hot air lance combined with oil and water free compressed air.~~

~~**101-3.9.2 Removal of Existing Sealant.** Existing sealants will be removed by routing random crack saw. Following routing sawing any remaining debris will be removed by use of a hot lance combined with oil and water free compressed air.~~

METHOD OF MEASUREMENT

101-4.1 PAVEMENT REMOVAL. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor, *regardless of the thickness or composition. Asphalt milling shall be measured by the square yard milled, regardless of thickness.* Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

~~**101-4.2 JOINT AND CRACK REPAIR.** The unit of measurement for joint and crack repair shall be the linear foot of joint.~~

~~**101-4.3 PAINT AND RUBBER REMOVAL.** The unit of measurement for paint and rubber removal shall be the square foot.~~

~~**101-4.4 SPALLED AND FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.**~~

~~**a.** The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the Engineer and the Contractor.~~

~~**b.** The unit of measure for failed asphaltic concrete pavement shall be square feet.~~

~~**101-4.5 COLD MILLING.** The unit of measure for cold milling shall be [ ] inches of milling per square yard. The location and average depth of the cold milling shall be determined and agreed to by the Engineer and the Contractor prior to beginning the work. If the initial cut doesn't correct the condition and surface correction is required, the Contractor shall re-mill the area and will be paid only once for the total depth of milling.~~

BASIS OF PAYMENT

101-5.1 PAYMENT. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-1	Concrete Pavement Removal - per Square Yard
Item P-101-2	Milling and Removal of Asphalt Pavement Surfacing (4" thickness) - per Square Yard

MATERIAL REQUIREMENTS

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

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ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions*. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. **Selective Grading.** When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3~~. *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. **Undercutting.** Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. **Overbreak.** Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* ~~will~~ be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**. The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of **2** coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed] [The quantity of compacted embankment in place to be paid for shall be the number of cubic yards measured in its final position.~~

Measurement of excavation/embankment shall be based on ***plan quantities****. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards measured in its original position at the borrow pit.

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D 4318.

154-2.2 SAMPLING AND TESTING. Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

154-3.2 OPERATION IN PITS. The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform

and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

154-3.3 PREPARING UNDERLYING COURSE. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources will be blended and mixed, the subbase material shall be processed in a central or travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers of not less than 3 inches nor more than 8 inches of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory

specimens shall be compacted and tested in accordance with **ASTM D1557, determined by the Contractor in the presence of the Engineer**. The in-place field density shall be determined in accordance with **ASTM D 6938 using Procedure A, the direct transmission method, and ASTM D 6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D 6938**. The moisture content of the material at the start of compaction shall be within ±2% of the optimum moisture content. All testing shall be done by **the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.**

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8 inch when tested with a 12 feet straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

154-3.8 SURFACE TOLERANCE. The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12-foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

154-3.9 THICKNESS CONTROL. The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown. ***There will be no separate payment for additional thickness.*** The thickness of the completed subbase course shall be determined by **depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards.**

154-3.10 PROTECTION. Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

154-3.11 MAINTENANCE. The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of **square yards at the thickness indicated on the PLANS** of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon **depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard of subbase course**. On individual depth measurements, thicknesses more than 1/2 inch in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per square yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-1	8" Subbase Course - per Square Yard

TESTING REQUIREMENTS

ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-154

ITEM P-155 LIME-TREATED SUBGRADE

DESCRIPTION

155-1.1 This item shall be used for soil modification to achieve specific needs that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans. ***Dry placing of lime shall not be used. Slurry placement of lime will be the only acceptable method of placement.***

MATERIALS

155-2.1 LIME. Quicklime and hydrated lime, either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone shall not be permitted.

155-2.2 COMMERCIAL LIME SLURRY. Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

a. **Chemical Composition.** The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.

b. **Residue.** The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve = maximum 0.0%
Residue retained on a No. 10 sieve = maximum 1.0%
Residue retained on a No. 30 sieve = maximum 2.5%

c . **Grade.** Commercial lime slurry shall conform to one of the following two grades:

Grade 1 – The "dry solids content" shall be at least 31% by weight, of the slurry.

Grade 2 – The "dry solids content" shall be at least 35%, by weight, of the slurry.

d. Submittals. *The Contractor shall submit to the Engineer certified test results or manufacturer's certification on the quicklime or lime slurry mix to be used before construction. No work shall begin nor shall any lime or lime slurry be placed for payment until the Contractor has submitted samples of the materials intended for use and the materials have been approved by the Engineer.*

155-2.3 WATER. Water used for mixing or curing shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

155-2.4 SOIL. The soil for this work shall consist of inorganic natural materials on the site or selected materials from other sources; uniform in quality and gradation; and shall be approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches.

COMPOSITION

155-3.1 SOIL-LIME MIXTURE. Lime shall be applied at the rate specified on the plans for the depth of subgrade treatment shown.

155-3.2 TOLERANCES. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Lime	+ 0.5%
Water	+ 2%, -0%

WEATHER LIMITATIONS

155-4.1 WEATHER LIMITATION. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply lime unless the air temperature is at least 40°F and rising. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35°F, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.

Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 EQUIPMENT. The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the lime or lime slurry, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

CONSTRUCTION METHODS

155-6.1 GENERAL. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent courses. The Contractor shall be responsible to meet the above requirements.

Before beginning lime treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. The machine must give visible indication at all times that it is cutting the material uniformly to the proper depth over the entire width of the cut.

If a cutting and pulverizing machine is not used, the material to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. The excavated material shall then be spread to the desired cross-section and uniformly mixed and compacted.

155-6.2 APPLICATION. Lime shall be spread only over an area where the initial mixing operations can be completed during the same work day. The application and mixing of lime with the soil shall be accomplished by the methods described as "Dry Placing" or "Slurry Placing." The Contractor may use either method when hydrated lime is specified.

~~a. **Dry Placing.** The lime shall be spread uniformly over the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as specified on the plans. The material shall be sprinkled until the specified moisture content has been reached.~~

~~The lime shall be distributed in a manner that will minimize scattering by wind. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to proper application. A motor grader shall not be used to spread the lime.~~

b. Slurry Placing. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry. Commercial lime slurry shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime shall be by successive passes over a measured section of subgrade until the specified amount of lime has been spread. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as shown on the plans. The distributor truck shall continually agitate the slurry to keep the mixture uniform.

155-6.3 MIXING. The mixing procedure shall be the same for "Dry Placing" or "Slurry Placing" as hereinafter described:

a. Preliminary Mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 5% above the optimum moisture of the material and to ensure chemical action of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 48 hours or until the material becomes friable. During the curing period, the material shall be sprinkled as directed by the Engineer.

b. Final Mixing. After the required curing time, the material shall be uniformly mixed by approved methods. If the mixture contains clods, they shall be reduced in size by blading, discing, harrowing, scarifying, or the use of other approved pulverization methods so that the remainder of the clods shall meet the following requirements when tested dry by laboratory sieves. After curing, pulverize lime treated material until soil particles pass a one inch sieve and 60% pass the No. 4 sieve. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 COMPACTION. Compaction of the mixture shall immediately follow the final mixing operation with no part of the mixture uncompacted more than 30 minutes after final mixing. The material shall be aerated or sprinkled as necessary to provide the optimum moisture content during compaction. The field density of the compacted mixture shall be at least 93% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested *by the Contractor* in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in- place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. Testing frequency shall be a minimum of one compaction test per **500** square yards of stabilized base or as directed by the Engineer.

The material shall be sprinkled and rolled as directed by the Engineer. All irregularities, depressions, or weak spots that develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the subgrade shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed on it or the work is accepted by the Engineer.

The full depth of the material shown on the plans shall be compacted to remain firm and stable under construction equipment. ~~All~~ *In-place* testing shall be done by the Engineer. Perform in-place density test

to determine degree of compaction between 24 and 72 hours after final compaction and 24 hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. The shape of the course shall be maintained smooth and shall conform to the typical section shown on the plans and the established lines and grades. If the material loses the specified stability, density, and finish before the next course is placed or the work is accepted by the Engineer, the material shall be recompacted and refinished by the Contractor, and the cost shall be incidental to this item.

155-6.5 FINISHING AND CURING. After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch when tested with a 12 feet straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.

The completed section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer. Subsequent courses shall be applied within 14 days after the lime-treated subgrade is cured.

155-6.6 THICKNESS. The thickness of the final lime-treated subgrade shall be not less than the thickness specified. Thickness shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 300 square yards. When the base deficiency is more than 1/2 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace the base material where borings are taken for test purposes. This cost shall be incidental to this item.

155-6.7 MAINTENANCE. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

155-6.8 HANDLING AND SAFETY. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work.

155-7.2 Lime shall be paid by the number of tons of Hydrated Lime, or the calculated equivalent, used in the completed and accepted work. "Calculated Equivalent" will be determined by the Engineer as follows:

a. Hydrated lime delivered to the project in dry form will be measured according to the actual tonnage either spread on the subgrade or batched on site into a slurry, whichever is applicable.

b. Lime delivered to the project in slurry form will be paid for on the basis of certified chemical composition tickets and batch weight tickets. The Owner shall reserve the right to have the dry lime content verified by an independent testing laboratory. If the chemical composition is reported on the basis of Pebble Quicklime, the equivalent hydrated lime will be determined in accordance with paragraph c. below.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade at the thickness specified. The price shall be full compensation for furnishing all material, except the lime,

and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

155-8.2 Payment shall be made at the contract unit price per pound of lime. This price shall be full compensation for furnishing, delivery, and placing this material.

Payment will be made under:

Item P-155-1	16" Lime-treated subgrade - per Square Yard
Item P-155-2	Lime - per Ton

TESTING REQUIREMENTS

ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

MATERIAL REQUIREMENTS

ASTM C 51	Standard Terminology Relating to Lime and Limestone (as used by the Industry)
ASTM C 977	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
ASTM D 3551	Standard Practice for Laboratory Preparation of Soil-Lime Mixtures Using Mechanical Mixer

END OF ITEM P-155

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ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be design, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

***156-1.2** This item covers the application of Temporary Erosion Control items at locations shown on the Plans, as directed by the Engineer, and as required for permit compliance, and the **requirement** of the Contractor to produce, execute, and maintain a specific Storm Water Pollution Prevention Plan (SWPPP) for the project. The Contractor will also be required to request and obtain all necessary federal, state, and local permits. The temporary erosion control measures shown in the Plans do **not** represent the extent of work and coordination required by the Contractor under this item.*

MATERIALS

156-2.1 GRASS. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

156-2.2 MULCHES. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per ItemT-908. Mulches shall not create a wildlife attractant.

156-2.3 FERTILIZER. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 SLOPE DRAINS. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 SILT FENCE. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461

156-2.6 OTHER. All other materials shall ~~meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project~~ *be in accordance with SECTION 506 – TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS of the Standard Specifications, except as modified or augmented herein. Heavy Duty silt fencing (with welded wire in the fabric) may be required on*

steep slopes if the Engineer determines that the silt fence used by the Contractor is not performing satisfactory.

CONSTRUCTION REQUIREMENTS

156-3.1 GENERAL. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

~~The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.~~

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 INSTALLATION, MAINTENANCE AND REMOVAL OF SILT FENCES. Silt fences shall extend a minimum of 16 inches and a maximum of 34 inches above the ground surface. Posts shall be set no more than 10 feet on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch overlap and securely sealed. A trench shall be excavated approximately 4 inches deep by 4 inches wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

156-3.5 CONSTRUCTION METHODS. *Providing the temporary erosion control items and devices shown on the Plans is intended to minimize the erosion of soils during construction. However, the items and devices shown are not intended to represent all of the necessary items or procedures required to be implemented by the Contractor. The plans and specifications show the Engineer's estimate of a minimum effort needed to maintain proper erosion control during construction. Additional effort and materials may be required by the Contractor to minimize the erosion of soils during construction. It shall be the Contractor's responsibility to install and maintain all the items shown in the Plans and to coordinate, submit, obtain, and comply with all necessary Federal, State, and local permits. The coordination with governing agencies shall include, but not limited to the following:*

- *Filing the Notice of Intent with TCEQ and paying any fee(s) required with the filing,*
- *Producing and maintaining an approved Storm Water Pollution Prevention Plan,*
- *Coordinating and obtaining all local permits regarding grading operations for the proposed improvements, Contractor's staging area, spoil placement and any other grading operations related to the project as directed by the local governing agency.*
- *Filing the Notice of Termination with TCEQ and paying any fee(s) required with the filing.*

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as *one complete item. This work includes obtaining all necessary federal, state, and local permits required to complete this project.* ~~follows:~~

~~a. Temporary seeding and mulching will be measured by the square yard.~~

~~b. Temporary slope drains will be measured by the linear foot.~~

~~c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard of excavation performed, including necessary cleaning of sediment basins, and the cubic yard of embankment placed as directed by the Engineer.~~

~~d. All fertilizing will be measured by the ton.~~

~~e. Installation and removal of silt fence will be measured by the [linear foot] [Lump sum].~~

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 *Temporary erosion control acceptably completed will be paid for at the contract lump sum price bid for "TEMPORARY EROSION CONTROL," which shall be full compensation for furnishing all materials, tools, equipment, labor, and incidentals necessary to complete the work. Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer. Payment for "TEMPORARY EROSION CONTROL" will also include obtaining and compliance with the SWPPP, which shall include compensation for drainage-way inspections, report preparation, housekeeping practices, cleaning and maintenance, and other actions outlined in the SWPPP prepared by the Contractor necessary to execute the Plan. This item consists of all erosion control items not listed as a separate pay item in the Unit Price Schedule. Any fines issued to the Owner as a result of the Contractor's insufficient execution of the SWPPP will be assessed to the Contractor. Such deductions shall not be limited to the lump sum price of this item.*

Payment will be made under:

Item P-156-1	*Temporary Erosion Control—per Lump Sum*

~~**156-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:~~

~~Item P-156-5.1a~~	~~Temporary seeding and mulching—per Square Yard.~~
~~Item P-156-5.1b~~	~~Temporary slope drains—per Linear Foot.~~
~~Item P-156-5.1c~~	~~Temporary benches, dikes, dams and sediment basins—per Cubic Yard~~
~~Item P-156-5.1d~~	~~Fertilizing—per Ton~~
~~Item P-156-5.1e~~	~~Installation and removal of silt fence [per Linear Feet] [Lump Sum]~~

~~Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.~~

~~Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.~~

MATERIAL REQUIREMENTS

ASTM D6461	Standard Specification for Silt Fence Materials
AC 150/5200-33	Hazardous Wildlife Attractants

END OF ITEM P-156

ITEM P-501 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 AGGREGATES.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine Aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than 0.075mm (No. 200 sieve)	ASTM C117	3.0

Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse Aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than one inch, the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40% when tested in accordance with ASTM C 131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve (9 mm) shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (0.075mm)	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.0)	1.0
Total of all deleterious Material		3.0

Table 1. Gradation for Coarse Aggregate (ASTM C33)

Sieve Designations (square openings)		Percentage by Weight Passing Sieves	
inch	mm	#4 1-1/2 inch – 3/4 inch	#57 1 inch – No. 4
2-1/2	60	---	---
2	50	100	---
1-1/2	38	90-100	100
1	25	20-55	95-100
3/4	19	0-15	---
1/2	13	---	25-60
3/8	9	0-5	---
No. 4	4.75	---	0-10
No. 8	2.36	---	0-5

(1) Aggregate susceptibility to Disintegration (D) Cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation CF = (cumulative percent retained on the 3/8 in. sieve)(100) / (cumulative percent retained on the No. 8 sieve)

(c) The Workability Factor WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF- 28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 CEMENT. Cement shall conform to the requirements of ASTM C 150 Type I.

If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

~~**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.~~

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 JOINT SEAL. The joint seal for the joints in the concrete pavement shall meet the requirements of **Item P-605** and shall be of the type specified in the plans.

501-2.5 ISOLATION JOINT FILLER. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1752, Type II or III and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Carbon-Steel Bars conforming to the requirements of ASTM A615.

501-2.7 DOWEL AND TIE BARS. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted.

Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 WATER. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 ADMIXTURES. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:

Constituent:	Limit (Percent by Mass):
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 EPOXY-RESIN. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1 GENERAL. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 PROPORTIONS. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of **650** psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **517** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall not be more than **0.45** by weight

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a slump for sideform concrete between 1 and 2 inches (25 mm and 50 mm) as determined by ASTM C143. At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at seven (7) and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted

to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.

b. Reactivity Test Results.

c. Coarse aggregate quality test results, including deleterious materials.

d. Fine aggregate quality test results, including deleterious materials.

e. Mill certificates for cement and supplemental cementitious materials.

f. Certified test results for all admixtures, including Lithium Nitrate if applicable.

g. Specified flexural strength, slump, and air content.

h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.

k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b.Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from

laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.4 ADMIXTURES.

a. Air-Entraining admixtures. Air-entraining admixture is to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **5.5%**. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 CONCRETE MIX DESIGN LABORATORY. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

CONSTRUCTION METHODS

501-4.1 EQUIPMENT. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch Plant and Equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and Transportation Equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Nonagitator trucks. Nonagitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing Equipment. The standard method of constructing concrete pavements **may** be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float- finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 lbs per foot of paving lane width and powered by an engine having at least 6.0 horsepower per foot of lane width.

On projects requiring less than 500 square yard of cement concrete pavement or requiring individual placement areas of less than 500 square yard, or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025- 0.05 inch.

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete Saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100-foot radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting

sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 FORM SETTING. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8 inch at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 CONDITIONING OF UNDERLYING SURFACE. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3 feet to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete.

The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 CONDITIONING OF UNDERLYING SURFACE, SIDE-FORM AND FILL-IN LANE CONSTRUCTION. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 HANDLING, MEASURING, AND BATCHING MATERIAL. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 MIXING CONCRETE. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators.

Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold Weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials

b. Hot Weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature Management Program. Prior to the start of paving operation for each day of paving, the contractor shall provide the engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

501-4.8 PLACING CONCRETE. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches **a flexural strength of 550 psi, based** on the average of four field cured specimens per 2,000 cubic yards of concrete placed. Also, subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi.

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-Form Construction. The concrete shall be distributed uniformly into final position by a self- propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full

width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8000 to 12000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude shall vary proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500 foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

b. Side-Form Construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines.

These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than one foot from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6 to 15 inches on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire- brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 JOINTS. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2 inch from their designated position and shall be true to line with not more than 1/4 inch variation in 10 feet. The surface across the joints shall be tested with a 12 feet straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that

spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

d. Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

e. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer.

f. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

g. Placing dowels and tie bars. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8 inch per feet. Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of ±5/8 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch. The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6 inches to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum **flexural strength of 450 psi** before drilling commences. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of ±1/2 inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of Joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 FINISHING. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straight edge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8 inch of mortar-rich surface (defined as deficient in plus U.S. No. 4 (4.75 mm) sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be

used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least one foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike- off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straight-edge Testing and Surface Correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8

inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Burlap Drag Finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard (555 grams per square meter). To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16 inch in depth.

501-4.13 CURING. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 sq ft. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to

remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

~~**c. Water Method.** The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.~~

d. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

~~**501-4.15 SAW-CUT GROOVING.** If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

501-4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with **Item P-605.**

501-4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 OPENING TO TRAFFIC. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 lb / square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 REPAIR, REMOVAL, REPLACEMENT OF SLABS.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

b. Shrinkage Cracks. Shrinkage cracks, which do not exceed 4 inches in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4 inches in depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs With Cracks through Interior Areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches in depth, that extend into the interior area.

d. Cracks Close To and Parallel To Joints. All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6 inches either side of the joint shall be treated as specified here. Any crack extending more than 6 inches from the joint shall be treated as specified above in subparagraph c.

(1) Full Depth Cracks Present, Original Joint Not Opened. When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure

injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full Depth Cracks Present, Original Joint Also Cracked. At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.

e. Removal and Replacement of Full Slabs. Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars. These joints shall then be carefully sawed on the joint line to within one inch of the depth of the dowel or tie bar.

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment.

Care shall be taken to prevent damage to the dowels, tie bars, or to concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

f. Repairing Spalls Along Joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inch. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high-pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat of epoxy resin, Type III, Grade I, shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Pooling of epoxy resin shall be avoided. The cavity shall be filled with low slump Portland cement

concrete or mortar or with epoxy resin concrete or mortar. Concrete shall be used for larger spalls, generally those more than 1/2 cu. ft. in size, and mortar shall be used for the smaller ones. Any spall less than 0.1 cu. ft. shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Portland cement concrete and mortar mixtures shall be proportioned as directed and shall be mixed, placed, consolidated, and cured as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140°F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper one-eight (1/8th) inch of the pavement surface.

g. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch wide and there shall be a minimum of 55 to 60 blades per 12 inches of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The area corrected by diamond grinding the surface of the hardened concrete should not exceed 10% of the total area of any sublot. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, may require removing and replacing in conformance with paragraph 501-4.19.

501-4.20 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR.

All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface.

a. Removal of Existing Pavement Slab.

When it is necessary to remove existing concrete pavement and leave adjacent concrete in place, unless there are dowels present, the joint between the removal area and adjoining pavement to stay in place, including dowels or tie bars, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made full depth just beyond the end of dowels. The edge shall then be carefully sawed on the joint line to within one inch of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 12 inches from the end of any dowels. All pavement between this last saw cut and the joint line shall be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or the approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in

the pavement which is to remain in place. Where dowels are present, care shall be taken to produce an even, vertical joint face below the dowels. If the Contractor is unable to produce such a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501- 4.10g. All this shall be at no additional cost to the Owner.

Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any direction greater than 1/2 inches and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

b. Edge repair.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas that are damaged during construction shall be repaired at no cost to the Owner.

(1) Spall repair. Spalls shall be repaired where indicated and where directed by the Engineer. Repair materials and procedures shall be as previously specified in subparagraph 501-4.19f.

(2) Underbreak repair. All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompacted, without addition of any new material. Finally, the void shall be completely filled with paving concrete, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound.

(3) Underlying material. The underlying material adjacent to the edge and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient material shall be kept in place outside the joint line to prevent disturbance (or sloughing) of material under the pavement that is to remain in place. Any material under the portion of the concrete pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified in paragraph 501-4.20b(2). The underlying material outside the joint line shall be thoroughly compacted and moist when new concrete is placed.

MATERIAL ACCEPTANCE

501-5.1 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the Engineer at no cost to the Contractor. The Contractor shall bear the cost of providing curing facilities for the strength specimens, per paragraph 501-5.1a(3), and coring and filling operations, per paragraph 501-5.1b(1). Testing organizations performing these tests shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Concrete shall be accepted for strength and thickness on a lot basis

A lot shall consist of a day's production not to exceed **2,500 square yards.**

a. Flexural Strength.

(1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete shall be sampled in accordance with ASTM C172.

(2) Testing. Two (2) specimens shall be made from each sample. Specimens shall be made in accordance with ASTM C31 and the flexural strength of each specimen shall be determined in accordance with ASTM C78. The flexural strength for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

Immediately prior to testing for flexural strength, the beam shall be weighed and measured for determination of a sample unit weight. Measurements shall be made for each dimension; height, depth, and length, at the mid-point of the specimen and reported to the nearest 1/10 inch. The weight of the specimen shall be reported to the nearest 0.1 pound. The sample unit weight shall be calculated by dividing the sample weight by the calculated volume of the sample. This information shall be reported as companion information to the measured flexural strength for each specimen.

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method.

Slump, air content, and temperature tests will also be conducted by the quality assurance laboratory for each set of strength test samples, per ASTM C31.

(3) Curing. The Contractor shall provide adequate facilities for the initial curing of beams. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

(4) Acceptance. Acceptance of pavement for flexural strength will be determined by the Engineer in accordance with paragraph 501-5.2b.

b. Pavement Thickness.

(1) Sampling. Each lot shall be divided into four equal sublots and one core shall be taken by the Contractor for each sublot. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, shall be excluded from sample locations.

Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes shall be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores shall be determined by the Engineer by the average caliper measurement in accordance with ASTM C174.

(3) Acceptance. Acceptance of pavement for thickness shall be determined by the Engineer in accordance with paragraph 501-5.2c.

c. Partial Lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they shall constitute a lot. Where one or two sublots have been produced, they shall be incorporated into the next lot or the previous lot and the total number of sublots shall be used in the acceptance criteria calculation, that is, n=5 or n=6.

d. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the percentage of material within specification limits (PWL) shall be determined using the remaining test values.

501-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-5.2e:

(1) Flexural strength
(2) Thickness
(3) Smoothness
(4) Grade
(5) Edge slump

Flexural strength and thickness shall be evaluated for acceptance on a lot basis using the method of estimating PWL. Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L).

Acceptance for flexural strength will be based on the criteria contained in accordance with paragraph 501-5.2e(1). Acceptance for thickness will be based on the criteria contained in paragraph 501-5.2e(2). Acceptance for smoothness will be based on the criteria contained in paragraph 501-5.2e(3). Acceptance for grade will be based on the criteria contained in paragraph 501-5.2e(4).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Flexural Strength. Acceptance of each lot of in-place pavement for flexural strength shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

c. Pavement Thickness. Acceptance of each lot of in-place pavement shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

d. Percentage of Material Within Limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The lower specification tolerance limit (L) for flexural strength and thickness shall be:

Lower Specification Tolerance Limit (L)

Flexural Strength	0.93 x strength specified in paragraph 501-3.1
Thickness	Lot Plan Thickness in inches, - 0.50 in

e. Acceptance Criteria.

(1) Flexural Strength. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(3) Smoothness. As soon as the concrete has hardened sufficiently, but not later than 48 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each section of pavement having an average profile index meeting the requirements of paragraph 501-8.1c when evaluated with a profilograph; and the finished surface of the pavement shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. When the surface smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the pavement, full depth removal and replacement of pavement shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet or more often if directed by the Engineer. Maximum gap on final pavement surface > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the one third points of paving lanes when widths of paving lanes are 20 ft or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. Smoothness readings will not be made across grade changes or cross slope transitions, at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement surface > 1/4 inch in longitudinal direction will be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

~~**(ii) Profilograph Testing.** Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.~~

~~The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. Deviations on final surface in longitudinal direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.~~

~~Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches per mile or less. If the initial average profile index was less than 15 inches, only those areas representing greater than 0.4 inch deviation will be re-profiled for correction verification.~~

~~**(iii) Final profilograph of runway.** Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.~~

~~Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 48 hours of placement of material. Smoothness texting indicated in paragraph (iii) shall be performed within 48 hours final paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then~~

~~production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.~~

(4) Grade. An evaluation of the surface grade shall be made by the Engineer for compliance to the tolerances contained below. The finish grade will be determined by running levels at intervals of 50 ft or less longitudinally and all breaks in grade transversely (not to exceed 50 ft) to determine the elevation of the completed pavement. The Contractor shall pay the costs of surveying the level runs, and this work shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

(a) Lateral Deviation. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.

(b) Vertical Deviation. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.

(5) Edge Slump. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer in accordance with paragraph 501-4.8a.

f. Removal and Replacement of Concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 501-4.10 shall apply to all contraction joints exposed by concrete removal. Removal and replacement shall be in accordance with paragraph 501-4.20.

CONTRACTOR QUALITY CONTROL

501-6.1 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that effect the quality of the pavement including but not limited to:

a. Mix Design
b. Aggregate Gradation
c. Quality of Materials
d. Stockpile Management
e. Proportioning
f. Mixing and Transportation
g. Placing and Consolidation
h. Joints
i. Dowel Placement and Alignment
j. Flexural or Compressive Strength
k. Finishing and Curing
l. Surface Smoothness

501-6.2 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

a. Fine Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 70 or ASTM C 566.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 566.

c. Slump. Four slump tests shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air Content. Four air content tests, shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Four unit weight and yield tests shall be made in accordance with ASTM C 138. The samples shall be taken in accordance with ASTM C 172 and at the same time as the air content tests.

501-6.3 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, moisture content and air content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and Coarse Aggregate Gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in the Lower Specification Tolerance Limit (L) table above and the Control Chart Limits table below shall be superimposed on the Control Chart for job control.

b. Slump and Air Content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

CONTROL CHART LIMITS			
Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1 inch	+0.5 to -1.5 inch	± 1.5 inch
Air Content	±1.2%	± 1.8%	± 2.5%
Fixed Form			
Slump	+ 0.5 to -1 inch	+1 to -1.5 inch	± 1.5 inch
Air Content	± 1.2%	± 1.8%	± 2.5%

The individual measurement control charts shall use the mix design target values as indicators of central tendency.

501-6.4 CORRECTIVE ACTION. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of control. The Contractor Quality Control Program shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and Coarse Aggregate Gradation. When two consecutive averages of five tests are outside of the specification limits in paragraph 501-2.1, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Fine and Coarse Aggregate Moisture Content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

c. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

d. Air Content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

METHOD OF MEASUREMENT

501-7.1 Portland cement concrete pavement shall be measured by the number of **square yards** of either plain or reinforced pavement as specified in-place, completed and accepted.

The Contractor's Quality Control Plan shall not be measured separately but shall be considered an incidental aspect of the pavement construction.

BASIS OF PAYMENT

501-8.1 PAYMENT. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-5.2 Acceptance Criteria shall be based on results of smoothness, strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness and 501-8.1c for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed **100 percent** of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both flexural strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both flexural strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either flexural strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both flexural strength and thickness are less than 100%.

PRICE ADJUSTMENT SCHEDULE [1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment limitation shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%.

b. Payment. Payment shall be made under:

Item P-501-1 12.5" Portland Cement Concrete Pavement—per square yard

c. Basis of adjusted payment for Smoothness. Price adjustment for pavement smoothness will apply to the total area of concrete within a section of pavement and shall be applied in accordance the following equation and schedule:

(Square yard in section) × (original unit price per square yard) × PFm = reduction in payment for area within section

Average Profile Index (Inches Per Mile) Pavement Strength Rating			Contract Unit Price Adjustment (PFm)
Over 30,000 lb	30,000 lb or Less	Short Sections	
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	0.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 and up	15.1 and up	22.1 and up	Corrective work required

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing With Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662 Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A714	Standard Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving And Structural Construction
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
AC 150/5320-6	Airport Pavement Design and Evaluation
PCA	Design and Control of Concrete Mixtures

END ITEM P-501

ITEM P-605 JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

This item shall also consist of the cleaning and sealing of cracks and joints in existing concrete pavement, at the locations shown in the plans or as directed by the Engineer. The amount of crack filling/sealing designated in the Plans is estimated.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealant materials shall meet the requirements of **ASTM D 5893, Type SL Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.**

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 BACKER ROD. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the ~~crack~~ joint.

605-2.3 BACKUP MATERIALS. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.4 BOND BREAKING TAPES. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.5 HERBICIDES. *Submit documentation on all herbicides to be used in the preparation of the joint replacement. Include in submittal proposed application rates in accordance with Texas Department of Agriculture regulations.*

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

Prior to beginning the sealing operation, the Contractor shall have the sealant supplier demonstrate, to the satisfaction of the Engineer, the cleaning and installation procedures for the joint sealant to be installed on the project.

If the pavement must be opened to traffic prior to placement of the sealant, Contractor to temporarily fill the joint with a jute or nylon rope immediately after the joint is sawed and or opened. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch below the pavement surface. The rope shall be removed immediately prior to cleaning and or sealing.

605-3.2 EQUIPMENT. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **15** days prior to use on the project.

605-3.3 PREPARATION OF JOINTS *IN NEW PAVEMENT*.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint faces shall be surface dry when the seal is applied.

Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Back-Up Material. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-Breaking Tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 INSTALLATION OF SEALANTS *IN NEW PAVEMENT*. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install

the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 PREPARATION OF JOINTS/CRACKS IN EXISTING PAVEMENT

a. Cleaning and Sealing of Cracks. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from the cracks shall be accomplished by routing. Cracks shall be routed so that the exposed face of the crack is enlarged to a width of 1/2" and to a depth as detailed in the sealant manufacturer's recommendations. Other methods of crack cleaning and preparation may be used with the approval of the Engineer.*

b. Cleaning and Sealing of Joints. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from existing joints shall be accomplished via the use of a high temperature compressed air lance. Existing joint sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. Other methods of joint cleaning and preparation may be used ONLY with the approval of the Engineer.*

If vegetation is a problem a soil sterilant shall be applied. Soil sterilants shall contain Bromacil (or equal) or Diuron (or equal) and shall be approved by the Engineer. Application rates shall be maximum recommended by the manufacturer.

When the cracks/joints are thoroughly dry, and just prior to sealant placement, both vertical faces shall be cleaned by sandblasting with a nozzle attached to an aiming device that directs the sand blast at approximately a 45 degree angle and a maximum of two inches from the face of the crack/joint. Each crack/joint face shall be sandblasted individually. After sandblasting, compressed air shall be used to blow out the crack/joint and remove all residual dust. Air compressors shall be equipped with suitable traps capable of removing all free water and oil from the compressed air and shall be capable of furnishing air with a pressure greater than 90 psi. The cracks/joints shall be thoroughly dry before the sealant is placed.

All cracks/joints shall be sealed the same day of the final sandblasting. Cleaned cracks/joints left open overnight or cracks/joints which become contaminated before sealing shall be re-cleaned as specified above.

605-3.6 INSPECTION. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.7 CLEAN-UP. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 *For joint sealing in newly constructed pavements, there will be no measurement for payment under this item. For joint cleaning and re-sealing in existing concrete pavement,* Joint sealing ~~material~~ shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 *For joint sealing in newly constructed pavements, there will be no separate payment under this item. Include costs associated in this item as subsidiary to other items.*

605-5.2 *For joint cleaning and re-sealing in existing concrete pavement,* Payment for joint sealing material shall be made at the contract unit price per **linear foot**. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-1	Concrete Joint Clean and Seal - per Linear Foot

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

END OF ITEM P-605

ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of reinforced structural Portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

Gradation For Coarse Aggregate

Percentage by Weight Passing Sieves	Sieve Designation (square openings)
	No. 4 to 1 in. (4.75-25 mm)
2" (50 mm)	---
1-1/2" (38 mm)	100
1" (25 mm)	90-100
3/4" (19 mm)	---
1/2" (12 mm)	25-60
3/8" (9 mm)	---
No. 4	0-10

610-2.2.1 AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING. Aggregates that have a history of D-cracking shall not be used.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 CEMENT. Cement shall conform to the requirements of **ASTM C 150** Type **I or II**.

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

610-2.6 ADMIXTURES AND SUPPLEMENTARY CEMENTITIOUS MATERIAL. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-Entraining Admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

~~**c. Other chemical admixtures**. The use of set retarding, and set accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.~~

~~**d. Lithium nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:~~

~~Constituent~~	~~Limit (Percent by Mass)~~
~~LiNO3 (Lithium Nitrate)~~	~~30 ±0.5~~
~~SO4 (Sulfate Ion)~~	~~0.1 (max)~~
~~Cl (Chloride Ion)~~	~~0.2 (max)~~
~~Na (Sodium Ion)~~	~~0.1 (max)~~
~~K (Potassium Ion)~~	~~0.1 (max)~~

~~Provide a trained representative to supervise the lithium nitrate admixture dispensing and mixing operations.~~

e. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of ASTM **D 1752.**

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of **Reinforcing Steel** conforming to the requirements of **ASTM A615.**

610-2.10 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to **one of the following**.

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of **3,000 psi** in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, ±1%, as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 QUALIFICATIONS FOR CONCRETE TESTING SERVICE. Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

610-3.5 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

610-3.6 CONSISTENCY. The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

610-3.7 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

610-3.8 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.9 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

610-3.10 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.11 EMBEDDED ITEMS. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.12 PLACING CONCRETE. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been ~~approved~~ *reviewed by the Engineer.* Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.13 VIBRATION. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a

compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

610-3.14 CONSTRUCTION JOINTS. If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.15 EXPANSION JOINTS. Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

610-3.16 DEFECTIVE WORK. Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

610-3.17 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

610-3.18 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

610-3.19 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.20 COLD WEATHER PLACING. When concrete is placed at temperatures below 40°F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F.

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds of Type 1 nor more than 1.6 pounds of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas,

framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F until at least 60% of the designed strength has been attained.

610-3.21 HOT WEATHER PLACING. Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed **90**°F when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

610-3.22 FILLING JOINTS. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete shall be ~~measured by the number of cubic yards of concrete complete in place and accepted. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer.~~ *not be measured for separate payment unless otherwise noted.* No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions in yardage shall be made for the volumes of reinforcing steel or embedded items.

610-4.2 Reinforcing steel shall be *not be measured for separate payment.* ~~measured by the calculated theoretical number of pounds placed, as shown on the plans, complete in place and accepted. The unit weight used for deformed bars shall be the weight of plain square or round bars of equal nominal size. If so indicated on the plans, the poundage to be paid for shall include the weight of metal pipes and drains, metal conduits and ducts, or similar materials indicated and included.~~

BASIS OF PAYMENT

610-5.1 Payment shall *not be paid for separately but shall be considered subsidiary to the item in which it is contained, unless otherwise noted.* ~~be made at the contract unit price per cubic yard for structural Portland cement concrete and per pound for reinforcing steel. These prices shall be full compensation for furnishing all materials and for all preparation, delivery and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

~~Payment will be made under:~~

~~Item P-610-5.1 Structural Portland Cement Concrete – per Cubic Yard~~

~~Item P-610-5.2 Steel Reinforcement – per Pound~~

TESTING REQUIREMENTS

ASTM C 31 Making and Curing Test Specimens in the Field

ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 666	Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar-Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A 184	Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 704	Welded Steel Plain Bars or Rod Mats for Concrete Reinforcement
ASTM C 33	Concrete Aggregates
ASTM C 94	Ready-Mixed Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheet Materials for Curing Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 595	Blended Hydraulic Cements
ASTM C 618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T 26	Quality of Water to be Used in Concrete
ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 MARKING MATERIALS. Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2. Paint shall be furnished in **White (37925), Red (31136), Yellow (33538 or 33655), or Black (37038)** in accordance with Federal Standard No. 595.

a. WATERBORNE. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type I. The non- volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

~~**b. EPOXY.** Paint shall be a two-component, minimum 99% solids type system conforming to the following:~~

~~**(1) Pigments.** Component A. Percent by weight.~~

~~**(a) White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 18% minimum (16.5% minimum at 100% purity).~~

~~**(b) Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 14 to 17%.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~Epoxy resin shall be 75 to 79%.~~

~~**(2) Epoxy Content.** Component A. The weight per epoxy equivalent, when tested in accordance with ASTM D1652 shall be the manufacturer's target ±50.~~

~~**(3) Amine Number.** Component B. When tested in accordance with ASTM D2074 shall be the manufacturer's target ±50.~~

~~**(4) Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~(5) Daylight Directional Reflectance:~~

~~(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.~~

~~(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:~~

~~x .462~~	~~x .470~~	~~x .479~~	~~x .501~~
~~y .438~~	~~y .455~~	~~y .428~~	~~y .452~~

~~(6) Accelerated Weathering.~~

~~(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.~~

~~(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.~~

~~(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2b(5) above. Evaluate for conformance with the color requirements.~~

~~(7) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.~~

~~(8) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.~~

~~(9) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.~~

~~(10) Hardness, Shore. Hardness shall be at least 80 when tested in accordance with ASTM D2240.]~~

~~c. METHACRYLATE. Paint shall be a two component, minimum 99% solids-type system conforming to the following:~~

~~(1) Pigments. Component A. Percent by weight.~~

~~(a) White:~~
~~Titanium Dioxide, ASTM D476, type II shall be 8% minimum. Methacrylate resin shall be 18% minimum.~~

~~(b) Yellow and Colors:~~

~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

Organic yellow, other colors, and tinting as required to meet color standard.

Methacrylate resin shall be 18% minimum.

(2) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(3) Daylight Directional Reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(4) Accelerated Weathering.

(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2c(3) above. Evaluate for conformance with the color requirements.

(5) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.

(7) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.

(8) Hardness, Shore. Hardness shall be at least 60 when tested in accordance with ASTM D2240.

d. SOLVENT-BASE. Paint shall meet the requirements of Commercial Item Description A-A-2886B Type I, Type II, and Type III.

e. **PREFORMED THERMOPLASTIC AIRPORT PAVEMENT MARKINGS.** Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.

(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.

(a) The markings must be supplied with an integral, non- reflectorized black border.

(2) **Graded Glass Beads.**

(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type IV .

(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (±10%) per 10 square feet. These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.

Size Gradation		Retained, %	Passing, %
US Mesh	µm		
12	1700	0 – 2	98 – 100
14	1400	0 - 3.5	96.5 – 100
16	1180	2 – 25	75 – 98
18	1000	28 – 63	37 – 72
20	850	63 – 72	28 – 37
30	600	67 – 77	23 – 33
50	300	89 – 95	5 – 11
80	200	97 – 100	0 – 3

(3) **Heating Indicators.** The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.

(4) **Pigments.** Percent by weight.

(a) **White:**
Titanium Dioxide, ASTM D476, type II shall be 10% minimum.

(b) **Yellow and Colors:**
Titanium Dioxide, ASTM D476, type II shall be 1% minimum.

Organic yellow, other colors, and tinting as required to meet color standard.

(5) **Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(6) **Daylight Directional Reflectance.**

(a) **White:**

The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x	.462	x .470	x .479	x .501
y	.438	y .455	y .428	y .452

(7) Skid Resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil.

(9) Environmental Resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed Thermoplastic Airport Pavement Marking Requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross- sectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be re-opened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements for **Federal Specification TT-B-1325D, Type I, Gradation A.** Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. **Painting operations shall be discontinued when the surface temperature exceeds 120°F.** Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by **waterblasting** or by other methods as required to remove all contaminants while minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. *Grinding of the pavement will not be permitted.* After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are cleaned of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

At least 24 hours prior to remarking existing markings, the existing markings must be ~~**removed**~~ *prepared* **such that** ~~**75% existing markings are removed**~~ *any loose or contaminated material that will affect the bond of the new paint are removed.* **After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air or both.** *The preparation is NOT to damage the pavement around and beneath the paint being prepared for remarking. Any damage is to be corrected immediately at no additional cost to the Owner.*

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by

the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of **30 days** shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 TEST STRIP. Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS
~~**(See Note Regarding Red and Pink Paint)**~~

Paint Type	Paint Square feet per gallon, ft^2/gal	Glass Beads, Type I, Gradation A Pounds per gallon of paint—lb./gal.	Glass Beads, Type III Pounds per gallon of paint—lb./gal.	Glass Beads, Type IV Pounds per gallon of paint—lb./gal.
Waterborne Type I	**115 ft^2/gal max**	**7 lb/gal min (0.85 kg/l)**	--	--

When pavement markings are required on a newly placed pavement, the pavement markings shall be completed in two applications. The first application shall be 33% of the application rate specified in Table 1. The second application shall be 100% of the application rate specified in Table 1, placed in the opposite direction of the first pass. Glass beads shall only be included in the second application of the pavement markings.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 APPLICATION – PREFORMED AIRPORT PAVEMENT MARKINGS.

a. Asphalt and Portland Cement To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet and a free span between supporting wheels of no less than 18 feet. The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.

620-3.8 PROTECTION AND CLEANUP. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

620-3.9 REMOVAL OF EXISTING MARKINGS. *The existing pavement markings shown on the plans to be removed shall be removed without damaging the existing pavement. The markings shall be removed through the use of high-pressure water or other methods approved by the Engineer before removal operations begin. For areas to be repainted, the existing painted surface shall be cleaned by high-pressure water blasting or sand blasting, as required, to remove all foreign material which would reduce the bond between the new paint and the old paint.*

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be **the number of square feet of painting including reflective media when required** ~~**and the number of pounds of reflective media**~~ performed in accordance with the specifications and accepted by the Engineer. *Where multiple pavement marking applications are specified, there will be no separate payment for temporary pavement markings (first pass). If either the temporary or final application of pavement markings are not required, the contract quantity shall be adjusted according to the markings actually completed.*

The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting including reflective media when required, performed in accordance with the specifications and accepted by the Engineer.

620-5.2 *Payment shall be made at a lump sum price for paint marking removal. The price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.*

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract **price per square foot** for runway and taxiway painting and for reflective media *and lump sum for pavement marking removal. For paint markings*

placed on existing pavement markings, there is no separate pay for pavement marking preparation as described in this item and is to be considered inclusive of the pavement markings pay item. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1	Retro-Reflective Pavement Markings - per square foot
Item P-620-2	Non-Reflective Black Outline - per square foot
Item P-620-3	Pavement Marking Removal - per lump sum

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D
Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247 Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E
Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B

Paint, Traffic, Solvent Based

FED STD 595 Colors used in Government Procurement

AC 150/5340-1 Standards for Airport Markings

END OF ITEM P-620

ITEM P-631 REFINED COAL TAR EMULSION WITH ADDITIVES, SLURRY SEAL SURFACE TREATMENT

DESCRIPTION

631-1.1 This item shall consist of a mixture of emulsified asphalt, mineral aggregate, and water properly proportioned, mixed, and spread on an asphalt pavement surface, including airport pavements serving airplanes 12,500 lbs or less, roads, and other general applications. The purpose of this refined coal tar emulsion product is to provide a fuel-resistant surface where pavements are subjected to fuel spills. The application of the surface treatment shall be in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer.

631-1.2 GENERAL. This item shall consist of a mixture of refined coal tar emulsion, mineral aggregate, additives, and water properly proportioned, mixed and applied as a slurry seal on new or existing (aged) asphalt concrete pavement.

MATERIALS

631-2.1 REFINED COAL TAR EMULSION. A refined coal tar emulsion prepared from a high temperature refined coal tar conforming to the requirements of ASTM D490 for grade 11-12. The use of oil and water gas tar is not allowed. Base refined coal tar emulsion must conform to all requirements of ASTM D5727.

a. Health, safety, and environment. The Contractor must provide a complete Material Safety Data Sheet (MSDS) in accordance with U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations (Standards – 29 CFR, 1910.1200) which establishes the requirement and minimum information for the MSDS for hazardous materials. The MSDS, Section II, shall include the Chemical Abstracts Service (CAS) registry numbers for all applicable hazardous ingredients in the coal tar emulsion product. The Contractor must provide the manufacturer's certification that the product complies with the Code of Federal Regulation (CFR) Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products (for the airport location) and Water Programs, Part 116, Designation of Hazardous Substances.

631-2.2 AGGREGATE. The aggregate shall be washed dry silica sand or boiler slag free of dust, trash, clay, organic materials or other deleterious substances. The aggregate shall meet the gradation in Table 1, when tested in accordance with ASTM C136.

Table 1. Gradation Of Aggregates*

Sieve Size		Percent Retained	
		Minimum	Maximum
#20 or coarser	(0.850 mm)	0	2
#30	(0.600 mm)	0	12
#40	(0.425 mm)	2	60
#50	(0.300 mm)	5	60
#70	(0.212 mm)	5	60
#100	(0.150 mm)	5	30
#140	(0.106 mm)	0	10
#200	(0.075 mm)	0	2
Finer than #200		0	0.3

* Table 1 represents the maximum range of aggregate gradations. In all cases the refined coal tar emulsion supplier is to give written approval of the aggregate used in the mix design.

631-2.3 ADDITIVE. As specified by the coal tar emulsion manufacturer.

631-2.4 WATER. Water for mixing shall be potable, free of harmful soluble salts, and at least 50°F.

631-2.5 CRACK SEALANT. Crack sealant shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.6 OIL SPOT PRIMER. Oil spot primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.7 PAVEMENT PRIMER. Pavement primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

COMPOSITION AND APPLICATION

631-3.1 COMPOSITION. The refined coal tar emulsion seal coat is to consist of a mixture of refined coal tar emulsion, water, additive and aggregate, and be proportioned as shown in Table 2. The composition must have written approval of the coal tar emulsion manufacturer.

631-3.2 QUANTITIES OF MATERIALS PER SQUARE YARD. The Contractor shall submit the recommended formulation of water, emulsion, aggregate and application rate proposed for use to a testing laboratory together with sufficient materials to verify the formulation at least **5** days prior to the start of operations. The mix design shall be within the range shown in the below table. No seal coat shall be produced for payment until a mix has been approved by the Engineer. The formulation shall pass the fuel resistance test in Addendum A.

The mix for each mixture shall be in effect until modified in writing by the Engineer.

Table 2. Composition Of Mixture Per 100 Gallons Of Refined Coal Tar Emulsion

Application	Refined Coal Tar Emulsion Gallons	Water Gallons	Additive Gallons	Aggregate Pounds	Formula Rate of Application of Mix per Square Yard	
					Minimum Gallons	Maximum Gallons
Prime Coat (where required) as specified by the coal tar emulsion manufacturer						
1st Seal Coat	100	25-70	2-6	300-700	0.12	0.20
2nd Seal Coat	100	25-70	2-6	300-700	0.12	0.20

631-3.3 APPLICATION RATE. Application rates are not to exceed 0.20 gal/yd^2/coat and at no time are total coats to exceed 0.51 gal/yd^2

631-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of mixture in the proportions shown in the approved mix design. The amount of mixture shall be sufficient to place a test section a minimum of 250 square yard at the rate specified in the job mix formula. The test area will be designated by the Engineer on a representative section of the pavement to be seal coated. The actual application rate will be determined by the Engineer during placement of the test section and will depend on the condition of the pavement surface.

The test section shall be used to verify the adequacy of the mix design and to determine the application rate. The same equipment and method of operations shall be used on the test section that will be used on the remainder of the work.

If the test section should prove to be unsatisfactory, the necessary adjustments to the job mix formula, mix composition, application rate, placement operations, and equipment shall be made. Additional test sections shall be placed and evaluated, if required. Full production shall not begin without the Engineer's approval. Acceptable test sections shall be paid for in accordance with paragraph 631-7.1.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying test areas and/or test sections to determine the optimum application rate of both emulsion and sand.

CONSTRUCTION METHODS

631-4.1 WEATHER LIMITATIONS. The seal coat shall not be applied when the surface is wet or when the humidity or impending weather conditions will not allow proper curing. The seal coat shall be applied only when the atmospheric or pavement temperature is 50°F and rising and is expected to remain above 50°F for 24 hours, unless otherwise directed by the Engineer.

631-4.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Distributors. Distributors or spray units used for the spray application of the seal coat shall be self-propelled and capable of uniformly applying 0.12 to 0.55 gallons per square yard of material over the required width of application. Distributors shall be equipped with removable manhole covers, tachometers, pressure gauges, and volume-measuring devices.

The mix tank shall have a mechanically powered, full-sweep, mixer with sufficient power to move and homogeneously mix the entire contents of the tank.

The distributor shall be equipped with a positive placement pump so that a constant pressure can be maintained on the mixture to the spray nozzles.

b. Mixing equipment. The mixing machine shall have a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, and emulsion, and of discharging the thoroughly mixed product on a continuous basis. The mixing unit shall be capable of thoroughly blending all ingredients together and discharging the material to the spreader box without segregation.

c. Spreading equipment. Spreading equipment shall be a mechanical-type squeegee distributor attached to the mixing machine, equipped with flexible material in contact with the surface to prevent loss of slurry from the spreader box. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; coal tar emulsion and aggregate build-up on the box shall not be permitted.

d. Hand squeegee or brush application. The use of hand spreading application shall be restricted to places not accessible to the mechanized equipment or to accommodate neat trim work at curbs, etc. Material that is applied by hand shall meet the same standards as that applied by machine.

e. Calibration. The Contractor shall furnish all equipment, materials and labor necessary to calibrate the equipment. It shall be calibrated to assure that it will produce and apply a mix that conforms to the job mix formula. Commercial equipment should be provided with a method of calibration by the manufacturer. All calibrations shall be made with the approved job materials prior to applying the seal coat to the pavement. A copy of the calibration test results shall be furnished to the Engineer.

631-4.3 PREPARATION OF ASPHALT PAVEMENT SURFACES. Clean pavement surface immediately prior to placing the seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface

film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with paragraph 101-3.6.

631-4.4 MIXING. Blend the coal tar emulsion mixture in the equipment described in paragraph 631-4.2 using the ingredients described in Table 2. The mixing must produce a smooth homogeneous mixture of uniform consistency. (Consult coal tar emulsion supplier for its recommended order of addition of the ingredients.) During the entire mixing and application process, no breaking, segregating or hardening of the emulsion, nor balling or lumping of the sand is to be permitted. Continue to agitate the seal coating mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application.

Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the specified amount.

631-4.5 APPLICATION OF SLURRY SEAL SURFACE TREATMENT. The aggregate filled slurry seal surface treatment shall be applied at a uniform rate determined in paragraph 631-3.3.

In order to provide maximum adhesion, the pavement shall be dampened with a fog spray of water if recommended by the supplier. No standing water shall remain on the surface.

If a prime coat is required, mix and apply the prime coat as specified in paragraph 631-4.3.

Apply the first coat uniformly to obtain the rate determined in paragraph 631-3.3.

Each coat shall be allowed to dry and cure initially before applying any subsequent coats. The initial drying shall allow evaporation of water of the applied mixture, resulting in the coating being able to sustain light foot traffic. The initial curing shall enable the mixture to withstand vehicle traffic without damage to the seal coat.

Apply the second coat in the same manner as outlined for the first coat.

Additional coats shall be applied over the entire surface as directed by the Engineer.

The finished surface shall present a uniform texture.

The final coat shall be allowed to dry a minimum of eight hours in dry daylight conditions before opening to traffic, and initially cure enough to support vehicular traffic without damage to the seal coat.

Where marginal weather conditions exist during the eight hour drying time, additional drying time shall be required. The length of time shall be as specified by the supplier. The surface shall be checked after the additional drying time for trafficability before opening the section to vehicle traffic.

Where striping is required, the striping paint used shall meet the requirements of P-620, shall be compatible with the seal coat and as recommended by the coal tar emulsion manufacturer.

QUALITY CONTROL

631-5.1 CONTRACTOR'S CERTIFICATION. The Contractor shall furnish the manufacturer's certification that each consignment of emulsion shipped to the project meets the requirements of ASTM D5727, except that the water content shall not exceed 50%. The certification shall also indicate the solids and ash content of the emulsion and the date the tests were conducted. The certification shall be delivered to the Engineer prior to the beginning of work. The manufacturer's certification for the emulsion shall not be interpreted as

a basis for final acceptance. Any certification received shall be subject to verification by testing samples received for project use.

The Contractor shall also furnish a certification demonstrating a minimum of three years of experience in the application of coal tar emulsion seal coats.

631-5.2 INSPECTION. The Contractor shall have an independent technical consultant on the job site at the beginning of operations for application of coal tar emulsion seal coats. The consultant shall have knowledge of the materials, procedures, and equipment described in this specification and shall assist the Contractor regarding proper mixing of the component materials and application of the seal coat. The consultant shall have a minimum of three (3) years of experience in the use of coal tar seal coats.

Documentation of this experience shall be furnished to the Engineer prior to the start of operations. The cost of the technical consultant shall be paid for by the Contractor.

631-5.3 SAMPLING. A minimum of one sample per day shall be tested for the properties of Table 2. A random sample of approximately one-quart of the composite mix will be obtained daily by the Contractor and stored in a glass container. The containers shall be sealed against contamination and retained in storage by the Owner for a period of six months. Samples shall be stored at room temperature and not be subjected to freezing temperatures.

A sample of undiluted coal tar emulsion shall be obtained from each consignment shipped to the job.

631-5.4 ENGINEER'S RECORDS. The Engineer will keep an accurate record of each batch of materials used in the formulation of the seal coat.

METHOD OF MEASUREMENT

631-6.1 The refined coal tar emulsion with additives shall be measured by the gallon. Only the actual quantity of undiluted refined coal tar emulsion with additives will be measured for payment.

631-6.2 Aggregate shall be measured by the ton of dry aggregate.

BASIS OF PAYMENT

631-7.1 Payment shall be made at the contract unit price per square yard for the refined coal tar emulsion with additives ~~and at the contract price per ton for aggregate~~.

These prices shall be full compensation for furnishing all materials, preparing, mixing, and applying these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat - per Square Yard

TESTING REQUIREMENTS

29 CFR Part 1910.1200 Hazard Communication

ASTM C67 Standard Test Method for Sampling and Testing Brick and Structural Clay Tile

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D5727	Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type)

MATERIAL REQUIREMENTS

ASTM D490	Standard Specification for Road Tar
ASTM D692	Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
ASTM D3699	Standard Specification for Kerosene
ASTM D4866	Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formations Containing Mineral Aggregates and Optional Polymeric Admixtures

END OF ITEM P-631

ADDENDUM A

ITEM P-631 FUEL RESISTANCE TEST AND CRITERION

1. **Scope**

This method determines the resistance of the coal tar emulsion seal coat to kerosene.

2. **Apparatus**

2.1. Two 6" I 6" square 16 gauge sheet metal masks with a 4" II 4" square center removed

2.2. 6" I16" unglazed white ceramic tile with an absorption rate of 10- 18% (determined in accordance with ASTM C67

Brass ring, 2" diameter and 2" high

2.3. Kerosene meeting requirements of ASTM D3699

2.4. Silicone rubber sealant

3. **Procedure**

3.1. Immerse the ceramic tile in distilled water for a minimum of ten minutes.

3.2. Remove excess water from the tile to produce a damp surface before applying the seal coat.

3.3. Using the mask described in 2.1 apply one layer of the coal tar emulsion mixture to the tile. Spread even with the top of the mask using a spatula or other straightedge.

3.4. Allow the sample to cure for 96 hours at 77 ±2°F. and 50 ±10% relative humidity.

3.5. Position a second mask on top of the first mask.

3.6. Apply a second coat of coal tar emulsion mixture. Spread even with the top of the second mask.

3.7. Cure as in step 3.4.

3.8. After curing, affix the brass ring to the seal coat on the tile with silicone rubber sealant.

3.9. Fill the brass ring with kerosene.

3.10. After 24 hours, remove the kerosene from the brass ring, blot dry and immediately examine the film for softness and loss of adhesion. Immediately after the film is examined, break the tile in half, exposing that part of the tile whose film was subjected to the kerosene.

3.11. Evaluate for penetration of kerosene through the sealer and loss of adhesion.

4. **Report**

Report the results as pass or fail. Visible evidence of leakage or discoloration shall constitute failure of the fuel resistance test.

5. **Criterion:** A "pass" rating in the fuel resistance test is required prior to full production.

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ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding *fertilizing, and watering* the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

MATERIALS

901-2.1 SEED The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb/acre (or lb/1,000
Green Sprangletop	*	*	**0.3**
Bermudagrass	*	*	**15.0**
Sideoats Grama (Haskell)	*	*	**4.5**

Seeding shall be performed during the period between **January 15** and **May 15** inclusive, unless otherwise approved by the Engineer.

~~**901-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [ ] All liming materials shall conform to the requirements of ASTM C 602.~~

901-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be ***30-30-30*** commercial fertilizer and shall be spread at the rate of **150 pounds per acre.**

901-2.4 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and before applying fertilizer ~~and ground limestone~~, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer ~~and ground limestone~~, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be *completely eradicated by means of herbicide or tillage* ~~cut or otherwise satisfactorily disposed of~~, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 DRY APPLICATION METHOD.

~~**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.~~

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 WET APPLICATION METHOD.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb / sq inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 MAINTENANCE OF SEEDED AREAS. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

Watering of the seeded areas shall be coordinated with the Owner and Airport Operations. Contractor will not be permitted to enter the airport secure areas to water without advanced approval.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units **acres** measured on the ground surface, completed and accepted. *Seeding shall be measured to the nearest tenth (0.1) of an acre. Fertilizer and watering will not be measured for separate payment but will be considered subsidiary to seeding.*

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per **acre** or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-1	Seeding, Including Fertilizing and Watering - per acre

MATERIAL REQUIREMENTS

ASTM C 602	Agricultural Liming Materials
ASTM D 977	Emulsified Asphalt
FED SPEC JJJ-S-181	Seeds, Agriculture

END OF ITEM T-901

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ITEM T-904 SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

904-2.1 SOD. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. ~~At least 70% of the plants in the cut sod shall be composed of the species stated in the Texas Department of Transportation Standard Specifications, – *Sodding* special provisions, and~~ *Sod may be either of Bermuda grass or buffalo grass.* Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the ~~special provisions.~~ *Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 162. Sod must be free from noxious weeds, Johnson grass, seed producing grasses, or any other matter deleterious to the growth and subsistence of the sod.*

~~**904-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [ ]. All liming materials shall conform to the requirements of ASTM C602.~~

904-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be standard commercial fertilizer and shall be spread at the rate *dictated by the representative soils test conducted by the contractor.*

904-2.4 WATER. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

904-2.5 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

904-3.1 GENERAL. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 PREPARING THE GROUND SURFACE. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

904-3.3 APPLYING FERTILIZER AND GROUND LIMESTONE. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches by discing, raking, or other suitable methods. Any stones larger than 2 inches in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 OBTAINING AND DELIVERING SOD. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 LAYING SOD. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch below the pavement edge.
Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 sq inch. The pegs shall be driven flush with the surface of the sod.

904-3.6 WATERING. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.7 ESTABLISHING TURF.

a. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

b. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

c. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

904-3.8 REPAIRING. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be sodded as specified in paragraph 904-3.5.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-1	Sodding - per square yard

MATERIAL REQUIREMENTS

ASTM C 602	Standard Specification for Agricultural Liming Materials

END OF ITEM T-904

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 TOPSOIL. *Topsoil source to be existing topsoil within the limits of the grading as shown on the Plans, and temporarily stockpiling topsoil on the airport property at a location acceptable to the airport and the Engineer.* Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. ~~The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117.*~~*Topsoil testing shall be completed and paid for by the Contractor.*~~

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 INSPECTION AND TESTS. Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 GENERAL. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 PREPARING THE GROUND SURFACE. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of

capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 PLACING TOPSOIL. The topsoil shall be evenly spread on the prepared areas to a uniform depth of inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil obtained on the site shall be measured by the ***area in square yards of the specified thickness of topsoil re-handled and placed from the topsoil stockpiled under Item P-152-2.10 as accepted by the Engineer. Topsoiling measured for payment shall only be the planned limits of construction.*** ~~number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoiling by the Contractor shall be measured by the number of cubic yards of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

~~**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per ~~cubic yard~~ *square yard of the specified thickness* for topsoiling (obtained on the site). This price shall be full compensation for furnishing all materials and for all *stripping and stockpiling topsoil at the airport, hauling,* preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

~~**905-5.2** Payment will be made at the contract unit price per cubic yard for topsoiling (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

Payment will be made under:

Item T-905-1	Topsoiling (Obtained on Site or Removed from Stockpile; 2" Thickness) - per square yard

TESTING MATERIALS

ASTM C 117 Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

END OF ITEM T-905

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ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications, at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 WIND CONES. The primary wind cone assembly shall be Type L-807(L) (Rigid Supporting Structure), Style I-B (Internally Lighted), Size 2 (36" Diameter by 12' Long) meeting the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

107-2.3 ELECTRICAL WIRE AND CABLE. Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

107-2.5 PLASTIC CONDUIT (for use below grade only). Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete.

107-2.7 PAINT

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification - Paint 25, Primer, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

107-3.2 SUPPORT POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTIONS. The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

~~**107-3.4 BOOSTER TRANSFORMER.** If shown in plans or specified in the job specifications, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof housing. The booster transformer shall be installed as indicated in the plans and described in the proposal. If the booster transformer is required for installation remotely from the wind cone, it shall be installed in accordance with and paid for per as described in Item L-109, Airport Transformer Vault and Vault Equipment.~~

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 4 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

107-3.6 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

107-3.7 LIGHT SOURCES. The Contractor shall furnish and install lamps per the manufacturer's instruction book.

107-3.8 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

107-3.9 SEGMENTED CIRCLE. The segmented circle shall be constructed in accordance with AC 150/5340-5, Segmented Circle Airport Marker System, and the details in the Plans.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

107-4.2 The quantity of segmented circle airport marker systems to be paid for shall be the number of systems installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107-5.1	L-807(L), Style I-B, Size 2 Wind Cone and Foundation, in Place – per Each
Item L-107-5.2	Segmented Circle Marker System, in Place – per Each

MATERIAL REQUIREMENTS

AC 150/5340-5	Segmented Circle Airport Marker System
AC 150/5340-30	Design and Installation Details for airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description. Spec A-A-3067	*Paint: Alkyd, Exterior, Low VOC*
Fed. Spec. TT-P-664D	*Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant*
Fed. Spec. W-C-1094	*Conduit and Conduit Fittings, Plastic, Rigid*
FED STD 595	Colors Used in Government Procurement
MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit – Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit - Steel
NFPA-70	National Electric Code (NEC)

END OF ITEM L-107

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ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in Item L-110, Airport Underground Electrical Duct Banks and Conduits.

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual aid Facilities, Table 5-

1 and paragraph 5.1.3.1, with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. ~~Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 [Type B] [Type C], 5,000 volts, nonshielded, with [ethylene propylene insulation] [cross-linked polyethylene insulation].~~ L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for ground wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or an approved equivalent, used for potting the splice is acceptable.

b. The Field-Attached Plug-In Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

c. The Factory-Molded Plug-in Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The Taped or Heat-Shrink Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 TAPE. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 ELECTRICAL COATING. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 EXISTING CIRCUITS. Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be

performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders

shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

(1) When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.

(2) Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 Item.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 inches (75 mm) deep, loose measurement, and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the compaction requirements per Item P-152 for that area shall be followed.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inch (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, and seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep.

At the location of each underground cable connection, except at lighting units, or isolation transformers, or power a concrete marker slab must mark adapters placed above the connection. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

a. Equipotential. – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

b. Isolation – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables.

For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

For raceways installed under pavement; for raceways and cables not installed adjacent to the full strength pavement edge; for fixtures installed in full strength pavement and shoulder pavement ~~and for optional method of edge lights installed in turf (stabilized soils); and for raceways or cables adjacent to the full strength pavement edge~~, the counterpoise conductor shall be centered over the raceway or cable to be protected as described below.

The counterpoise conductor shall be installed no less than 8 inches (203 mm) above the raceway or cable to be protected, except as permitted below.

The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise conductor shall be installed no more than 12 inches (305 mm) above the raceway or cable to be protected.

The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection.

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

c. A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

d. For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

108-3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall include additional quantities required for slack.

~~**108-4.3** Ground rods shall be measured by each [10-foot] section installed complete.~~

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	Trenching for Direct-Buried Cable, 18 Inch Minimum Depth – per Linear Foot
Item L-108-5.2	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit – per Linear Foot
Item L-108-5.3	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.4	No. 1/0 AWG, Stranded, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.5	Trenching for Direct-Buried Bare Counterpoise Wire, 8" Minimum Depth – per Linear Foot
Item L-108-5.6	No. 6 AWG Stranded, 600V Rated, Type THHN/THWN-2 Cable, Installed in Duct Bank or Conduit – per Linear Foot
Item L-108-5.7	No. 8 AWG Stranded, 600V Rated, Type THHN/THWN-2, Green Insulated Equipment Ground, Installed in Duct Bank or Conduit – per Linear Foot

MATERIAL REQUIREMENTS

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D33	*Tinned Soft of Annealed Copper Wire for Electrical Purposes*
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive
MIL-P-21035	*Paint High Zinc Duct Content, Galvanizing Repair*

REFERENCE DOCUMENTS

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems
MIL-S-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

~~**110-2.2 STEEL CONDUIT.** Rigid galvanized steel (RGS) conduit and fittings shall be hot-dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10~~

~~mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.~~

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I – Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II – Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III – HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28-day compressive strength of 3500 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work

progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated

before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, and seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Non-Encased, Electrical Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.2	Non-Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.3	Non-Encased, Schedule 40 PVC Drain Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.4	Encased, Electrical Conduit, 1-Way 2"C, with Flowable Fill and Sawcut Pavement Repair – per Linear Foot
Item L-110-5.5	Concrete Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.6	FAA-Style, Concrete Encased, Split Duct Conduit, 1-Way 3"C – per Linear Foot

MATERIAL REQUIREMENTS

Advisory Circular (AC) 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NFPA-70	National Electrical Code (NEC)
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit - Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit Steel
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel*. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

~~**115-3.13 MANHOLE ELEVATION ADJUSTMENTS.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.~~

~~The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.~~

~~The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans~~.

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections

- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

~~**115-4.2** Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.~~

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	FAA-Style, Precast Concrete Electrical Handhole, Aircraft-Rated, 3'Lx3'Wx3'D, Installed – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

MITCHELL
CIVIL CONSTRUCTION DIVISION

BID PROPOSAL:

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')
AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS
Jefferson County Project 17-024/JW

BID NO: IFB 17-024/JW
DUE DATE/TIME: 11:00 AM CDT, Tuesday, August 8, 2017

To:

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, TX 77701

RECEIVED 10:50 AM AUG 08 2017

Proposal From:

Mitchell Enterprises Ltd.
700 N. Crockett Street
Sherman, TX 75090
(903) 893-6593

ORIGINAL

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')
AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS
Jefferson County Project 17-024/JW



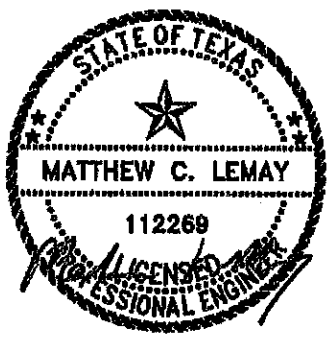
TEXAS REGISTERED ENGINEERING FIRM F-5713

Garver Project Number 17121501

June 2017

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')
AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS
Jefferson County Project 17-024/JW





Garver Project Number 17121501

July 2017

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SECTION A
ADVERTISEMENT AND INVITATION TO BID

JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah L. Clark, Purchasing Agent

1149 Pearl Street, 1st Floor, Beaumont, TX 77701 409-835-8593 Fax 409-835-8456

LEGAL NOTICE
Advertisement for Invitation for Bids

July 10, 2017

Notice is hereby given that sealed bids will be accepted by the Jefferson County Purchasing Department for IFB 17-024/JW, Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport . **Information for this project may be obtained from the Jefferson County website, http://www.co.jefferson.tx.us/Purchasing/main.htm or by calling 409-835-8593. Specifications, plans, and bidding documents can be obtained from CivCast website at https://www.civcastusa.com. Project ID is BPT_17-024/JW.**

Bids are to be sealed and addressed to the Purchasing Agent with the bid number and name marked on the outside of the envelope or box. Bidders shall forward an original and three (3) copies of their bid to the address shown below. Neither Jefferson County nor CivCast will accept bids submitted electronically. Late bids will be rejected as non-responsive. Bids will be publicly opened and read aloud in the Jefferson County Commissioners' Courtroom at the time and date below. Bidders are invited to attend the sealed bid opening.

BID NAME:	**Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport**
BID NO:	**IFB 17-024/JW**
DUE DATE/TIME:	**11:00 AM CDT, Tuesday, August 8, 2017**
MAIL OR DELIVER TO:	**Jefferson County Purchasing Department 1149 Pearl Street, 1st Floor Beaumont, Texas 77701**

There will be a pre-bid conference and walk-through at 10:00 AM CDT on Tuesday, July 25, 2017 in the Airport Administration Conference Room at 5000 Jerry Ware Blvd., Beaumont, Texas 77705. This conference will be bidder's only opportunity to view secured areas of the project.

The County shall require the bidder to furnish a bid security in the amount of five percent (5%) of the total contract cost. The bid bond must be executed with a surety company authorized to do business in the State of Texas. Within ten (10) days after the date of the signing of a contract, the bidder shall furnish a performance bond to the County for the full amount of the contract, if the contract exceeds one hundred thousand dollars ($100,000). If the contract is for one hundred thousand dollars ($100,000) or less, the County may provide that no money be paid to the contractor until completion and acceptance of the work or the fulfillment of the purchase obligation to the County.

Any questions relating to these requirements should be directed to Jamey West, Assistant Purchasing Agent, at 409-835-8593 or jwest@co.jefferson.tx.us

Jefferson County encourages Disadvantaged Business Enterprises to participate in the bidding process. Jefferson County does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in employment or the provisions of services. Individuals requiring special accommodations are requested to contact our office at 409-835-8593 to make arrangements no later than seven (7) calendar days prior to the submittal deadline. Jefferson County reserves the right to accept or reject any or all proposals, to waive technicalities and to take whatever action is in the best interest of Jefferson County.

All interested firms are invited to submit a bid in accordance with the terms and conditions stated in this bid.

Respondents are strongly encouraged to carefully read the entire invitation.

Deborah Clark

Deborah L. Clark, Purchasing Agent
Jefferson County, Texas

Publish: Beaumont Enterprise & Port Arthur News – July 12, 2017 and July 19, 2017

Bid Submissions:

Bidder is responsible for submitting:

- One (1) *original* bid copy to include a completed copy of this specifications packet, in its entirety.

- Written Number Here (# here) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

Additionally, Bidder must monitor the Jefferson County Purchasing Department Website (below) to see if addenda or additional instructions have been posted. Failure to return all required forms could result in a response being declared as non-responsive.

http://www.co.jefferson.tx.us/purchasing/main.htm

SECTION B
INSTRUCTIONS TO BIDDERS

Instructions to Bidders

1. Bid Submission

Bids must be submitted in complete original form by mail or messenger to the following address:

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, TX 77701

Bids will be accepted at the above address until the time and date specified herein, and immediately after will be publicly opened and read aloud.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked with the Bid Number, Bid Name, Bid Due Date, and the Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Late bids will not be accepted and will be returned unopened to the bidder.

All bids submitted in response to this invitation shall become the property of Jefferson County and will be a matter of public record available for review.

2. Bid Submissions During Time of Inclement Weather, Disaster, or Emergency

In case of inclement weather or any other unforeseen event causing the County to close for business on the date of a bid/proposal/statement of qualifications submission deadline, the bid closing will automatically be postponed until the next business day that County offices are open to the public. Should inclement weather conditions or any other unforeseen event cause delays in courier service operations, the County may issue an addendum to all known vendors interested in the project to extend the deadline. It will be the responsibility of the vendor to notify the county of their interest in the project should these conditions impact their ability to submit a bid/proposal/statement of qualifications submission before the stated deadline. The County reserves the right to make the final judgement call to extend any deadline.

Should an emergency or unanticipated event interrupt normal County processes, and bid/proposal/statement of qualifications submissions cannot be received by the Jefferson County Purchasing Department's office by the exact time specified in the IFB and urgent County requirements preclude amendment to the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first business day on which normal County processes resume.

3. Courthouse Security

Bidders are advised that all visitors to the Courthouse must pass through Security. **Bidders planning to hand deliver bids must allow time to get through Security, as a delay in entering the Courthouse will not be accepted as an excuse for late submittal.** Mondays and Tuesdays are particularly heavy days. Bidders are strongly urged to plan accordingly.

4. Preparation of Bids

The bid shall be legibly printed in ink or typed.

If a unit price or extension already entered is to be altered, it shall be crossed out and initialed in ink by the bidder.

The bid shall be legally signed and shall include the complete address of the bidder.

Jefferson County is exempt from Federal and State Sales Taxes, and such taxes shall not be included in bid prices.

5. Signatures

All bids, notifications, claims, and statements must be signed by an individual authorized to bind the bidder. The individual signing certifies, under penalty of perjury, that he or she has the legal authorization to bind the bidder.

6. County Holidays – 2017:

January 1st and 2nd	Sunday & Monday	New Year's Day
January 16	Monday	Martin Luther King, Jr. Day
February 20	Monday	President's Day
April 14	Friday	Good Friday
May 29	Monday	Memorial Day
July 4	Tuesday	Independence Day
September 4	Monday	Labor Day
November 10	Friday	Veterans Day
November 23rd & 24th	Thursday & Friday	Thanksgiving
December 25th	Monday	Christmas

7. Rejection or Withdrawal

Submission of additional terms, conditions or agreements with the bid document are grounds for deeming a bid non-responsive and may result in bid rejection. Jefferson County reserves the right to reject any and all bids and to waive any informalities and minor irregularities or defects in bids. Bids may be withdrawn in person by a bidder or authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the withdrawal is made prior to the time set for receipt of bids. Bids are an irrevocable offer and may not be withdrawn within 90 days after opening date.

8. Emergency/Declared Disaster Requirements

In the event of an emergency or if Jefferson County is declared a disaster area, by the County, State, or Federal Government, this Acceptance of Offer may be subjected to unusual usage. Contractor shall service the county during such an emergency or declared disaster under the same terms and conditions that apply during non-emergency/disaster conditions. The pricing as specified in this Acceptance of Offer shall apply to serving the County's needs regardless of the circumstances. If Contractor is unable to supply the services under the terms of the Acceptance of Offer, then Contractor shall provide proof of such disruption and a copy of the invoice from Contractor's supplier(s). Additional profit margin as a result of supplying services during an emergency or declared disaster shall not be permitted. In the event that additional equipment, supplies, and materials are required during the declared disaster, additional shipping, handling and drayage fees may apply.

9. Award

The bid will be awarded to the responsible, responsive bidder(s) whose bid, conforming to the solicitation, will be most advantageous to Jefferson County – price and other factors considered. Unless otherwise specified in this IFB, Jefferson County reserves the right to accept a bid in whole or in part, and to award by item or by group, whichever is deemed to be in the best interest of Jefferson County. Any bidder who is in default to Jefferson County at the time of submittal of the bid shall have that bid rejected. Jefferson County reserves the right to clarify any contractual terms with the concurrence of the Contractor; however, any substantial nonconformity in the offer, as determined by Jefferson County, shall be deemed non-responsive and the offer rejected.

In evaluating bids, Jefferson County shall consider the qualifications of the bidders, and, where applicable, operating costs, delivery time, maintenance requirements, performance data, and guarantees of materials and equipment. In addition, Jefferson County may conduct such investigation as it deems necessary to assist in the evaluation of a bid and to establish the responsibility, qualifications, and financial ability of the bidders to fulfill the contract.

Jefferson County reserves the right to award this contract on the basis of **lowest and best bid** in accordance with the laws of the State of Texas, to waive any formality or irregularity, to make awards to more than one offeror, and/or to reject any or all bids. In the event the lowest dollar offeror meeting specifications is not a awarded a contract, Offeror may appear before the Commissioners' Court and present evidence concerning Offeror responsibility after officially notifying the Office of the Purchasing Agent of Offeror's intent to appear.

10. Contract

A response to an IFB is an offer to contract with Jefferson County based upon the terms, conditions, and specifications contained in the IFB. Bids do not become contracts unless and until they are executed by Jefferson County, eliminating a formal signing of a separate contract. For that reason, all of the terms and conditions of the contract are contained in the IFB, unless any of the terms and conditions is modified by an IFB Amendment, a Contract Amendment, or by mutually agreed terms and conditions in the contract documents.

11. Waiver of Subrogation

Bidder and bidder's insurance carrier waive any and all rights whatsoever with regard to subrogation against Jefferson County as an indirect party to any suit arising out of personal or property damages resulting from bidder's performance under this agreement.

12. Fiscal Funding

A multi-year contract (if requested by the specifications) continuing as a result of an extension option must include fiscal funding out. If, for any reason, funds are not appropriated to continue the contract, said contract shall become null and void.

13. Bid Results

Bid results are not provided in response to telephone inquiries. A preliminary tabulation of bids received will be posted on the Purchasing web page (http://co.jefferson.tx.us/ purchasing/main.htm) as soon as possible following bid opening. A final tabulation will be posted following bid award, and will also be available for review in the Purchasing Department.

14. Changes and Addenda to Bid Documents

Each change or addendum issued in relation to this IFB document will be on file in the Office of the Purchasing Agent, and will be posted on the Purchasing web site as soon as possible. It shall be the bidder's responsibility to make inquiry as to change or addenda issued, and to monitor the web site. All such changes or addenda shall become part of the contract and all bidders shall be bound by such addenda. Information on all changes or addenda issued will be available at the Office of the County Purchasing Agent.

15. Specifications

Unless otherwise stated by the bidder, the bid will be considered as being in accordance with Jefferson County's applicable standard specifications, and any special specifications outlined in the bid document. References to a particular trade name, manufacturer's catalogue, or model number are made for descriptive purposes to guide the bidder in interpreting the requirements of Jefferson County, and should not be construed as excluding bids on other types of materials, equipment, and supplies. However, the bidder, if awarded a contract, will be required to furnish the particular item referred to in the specifications or description unless departure or substitution is clearly noted and described in the bid. Jefferson County reserves the right to determine if equipment/ product being bid is an acceptable alternate. All goods shall be new unless otherwise so stated in the bid. Any

unsolicited alternate bid, or any changes, insertions, or omissions to the terms and conditions, specifications, or any other requirements of the bid, may be considered non-responsive.

16. Delivery

Bids shall include all charges for delivery, packing, crating, containers, etc. Unless otherwise stated by the bidder (in writing on the included Bid Form), prices bid will be considered as being based on F.O.B. destination/delivered freight included.

17. Interpretation of Bid and/or Contract Documents

All inquiries shall be made within a reasonable time prior to the date and time fixed for the bid opening, in order that a written response in the form of an addendum, if required, can be processed before the bids are opened. Inquiries received that are not made in a timely fashion may or may not be considered.

18. Currency

Prices calculated by the bidder shall be stated in U.S. dollars.

19. Pricing

Prices shall be stated in units of quantity specified in the bid documents. In case of discrepancy in computing the amount of the bid, the unit price shall govern.

20. Notice to Proceed/Purchase Order

The successful bidder may not commence work under this contract until authorized to do so by the Purchasing Agent.

21. Certification

By signing the offer section of the Offer and Acceptance page, bidder certifies:

- The submission of the offer did not involve collusion or other anti-competitive practices.
- The bidder has not given, offered to give, nor intends to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to any public servant in connection with the submitted offer.
- The bidder hereby certifies that the individual signing the bid is an authorized agent for the bidder and has the authority to bind the bidder to the contract.

22. Definitions

"County" – Jefferson County, Texas.

"Contractor" – The bidder whose proposal is accepted by Jefferson County.

23. Minority-Women Business Enterprise Participation

It is the desire of Jefferson County to increase the participation of Minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the County does not have any preference or set aside programs in place, it is committed to a policy of equitable participation for these firms.

General Conditions of Bidding and Terms of Contract

By execution of this document, the vendor accepts all general and special conditions of the contract as outlined below and in the specifications and plans.

1. **Bidding**

1.1 Bids. All bids must be submitted on the bid form furnished in this package.

1.2 Authorized Signatures. The bid must be executed personally by the vendor, duly authorized partner of the partnership, or duly authorized officer of the corporation. If executed by an agent, a power of attorney or other evidence of authority to act on behalf of the vendor shall accompany the bid to become a valid bid.

1.3 Late Bids. Bids must be in the office of the Jefferson County Purchasing Agent before or at the specified time and date bids are due. Bids received after the submission deadline shall be rejected as non-responsive and returned unopened.

1.4 Withdrawal of Bids Prior to Bid Opening. A bid may be withdrawn before the opening date by submitting a written request to the Purchasing Agent. If time allows, the bidder may submit a new bid. Bidder assumes full responsibility for submitting a new bid before or at the specified time and date bids are due. Jefferson County reserves the right to withdraw a request for bids before the opening date.

1.5 Withdrawal of Bids after Bid Opening. Bidder agrees that its offer may not be withdrawn or cancelled by the vendor for a period of ninety (90) days following the date and time designated for the receipt of bids unless otherwise stated in the bid and/or specifications.

1.6 Bid Amounts. Bids shall show net prices, extensions where applicable and net total. In case of conflict between unit price and extension, the unit price will govern. Any ambiguity in the bid as a result of omission, error, unintelligible or illegible wording shall be interpreted in the favor of Jefferson County.

1.7 Exceptions and/or Substitutions. All bids meeting the intent of the specifications and plans will be considered for award. Vendors taking exception to the specifications and plans, or offering substitutions, shall state these exceptions in the section provided. If bid is made on an article other than the one specified, which a bidder considers comparable, the name and grade of said article must be specified in the bid and sufficient specifications and descriptive data must accompany same to permit thorough evaluation. The absence of stated exceptions and/or substitutions shall indicate that the vendor has not taken any exceptions to the specifications and shall be responsible to perform in strict accordance with the specifications. As a matter of practice, Jefferson County rejects exception(s) and /or substitutions as non-responsive but reserves the right to accept any and/or all of the exception(s) and/or substitution(s) deemed to be in the best interest of Jefferson County.

1.8 Alternates. The Invitation for Bid and/or specifications may expressly allow bidder to submit an alternate bid. Presence of such an offer shall not be considered an indication of non-responsiveness.

1.9 Descriptions. Unless otherwise specified, any reference to make, manufacturer and/or model used in the bid specifications is merely descriptive and not restrictive, and is used only to indicate type, style, or quality of material desired.

1.10 Bid Alterations. Bids cannot be altered or amended after submission deadline. Any interlineations, alterations, or erasures made before opening time must be initialed by the signer of the bid, guaranteeing authenticity.

1.11 Tax Exempt Status. Jefferson County is exempt from federal excise tax and state sales tax. Unless the bid form or specifications specifically indicate otherwise, the bid price must be net, exclusive of above-mentioned taxes and will be so construed. Therefore, the bid price shall not include taxes.

1.12 Quantities. Quantities indicated are estimated quantities only and are not a commitment to buy. Approximate usage does not constitute an order, but only implies the probable quantity that will be used. Commodities will be ordered on an as-needed basis. Bidder is responsible for accurate final counts.

1.13 Bid Award. Award of contract shall be made to the most responsible, responsive bidder, whose offer is determined to be the best value, taking into consideration the relative importance of price. Jefferson County reserves the right to be the sole judge as to whether items bid will serve the purpose intended. Jefferson County reserves the right to accept or reject in part or in whole any bid submitted, and to waive any technicalities or informalities for the best interest of the County. Jefferson County reserves the right to award based upon individual line items, sections or total bid.

1.14 Silence of Specifications for Complete Units. All materials, equipment and/or parts that will become a portion of the completed work, including items not specifically stated herein but, necessary to render the service(s) complete and operational per the specifications, are to be included in the bid price. Vendor may be required to furnish evidence that the service, as bid, will meet or exceed these requirements.

1.15 Addenda. Any interpretations, corrections or changes to the specifications and plans will be made by addenda no later than forty-eight (48) hours prior to the bid opening. Addenda will be posted on the Purchasing web site. Vendors are responsible for monitoring the web site in order to remain informed on addenda. Vendors shall acknowledge receipt of all addenda with submission of bid.

1.16 General Bid Bond/Surety Requirements. Failure to furnish bid bond/surety, if requested, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.17 General Insurance Requirements. Failure to furnish Affidavit of Insurance, if required in these specifications, will result in bid being declared non-responsive. Non-responsive bids will not be considered for award.

1.18 Responsiveness. A responsive bid shall substantially conform to the requirements of this Invitation to Bid and/or specifications contained herein. Bidders who substitute any other terms, conditions, specifications and/or requirements or who qualify their bids in such a manner as to nullify or limit their liability to the contracting entity shall have their bids deemed non-responsive. Also, bids containing any clause that would limit contracting authority shall be considered non-responsive. Examples of non-responsive bids include but shall not be limited to: a) bids that fail to conform to required delivery schedules as set forth in the bid request; b) bids with prices qualified in such a manner that the bid price cannot be determined, such as with vague wording that may include "price in effect at the time of delivery," and c) bids made contingent upon award of other bids currently under consideration.

1.19 Responsible Standing of Bidder. To be considered for award, bidder must at least: have the ability to obtain adequate financial resources, be able to comply with required or proposed

delivery/completion schedule, have a satisfactory record of performance; have a satisfactory record of integrity and ethics, and be otherwise qualified and eligible to receive award.

1.20 Proprietary Data. Bidder may, by written request, indicate as confidential any portion(s) of a bid that contain proprietary information, including manufacturing and/or design processes exclusive to the vendor. Jefferson County will protect from public disclosure such portions of a bid, unless directed otherwise by legal authority, including existing Open Records Acts.

1.21 Public Bid Opening. Bidders are invited to be present at the opening of bids. After the official opening of bids, a period of not less than one week is necessary to evaluate bids. The amount of time necessary for bid evaluation may vary and is determined solely by the County. Following the bid evaluation, all bids submitted are available for public review.

2. Performance

2.1 Design, Strength, and Quality. Design, strength, and quality of materials and workmanship must conform to the highest standards of manufacturing and engineering practices. The apparent silence of specifications and/or plans as to any detailed description concerning any point shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications and/or plans shall be made on the basis of this statement.

2.2 Age and Manufacture. All tangible goods being bid must be new and unused, unless otherwise specified, in first-class condition, of current manufacture, and furnished ready to use. All items not specifically mentioned that are required for a complete unit shall be furnished.

2.3 Delivery Location. All deliveries will be made to the address(es) specified on the purchase order during normal working hours of 8:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise authorized by the Purchasing Agent or designee.

2.4 Delivery Schedule. Delivery time may be an important consideration in the evaluation of best value. The maximum number of days necessary for delivery ARO shall be stated in the space, if provided, on the bid form.

2.5 Delivery Charges. All delivery and freight charges, F.O.B. destination shown on Jefferson County purchase order, as necessary to perform contract are to be included in the bid price.

2.6 Installation Charges. All charges for assembly, installation and set-up shall be included in the bid price. Unless otherwise stated, assembly, installation and set-up will be required.

2.7 Operating Instructions and Training. Clear and concise operating instructions and descriptive literature will be provided in English, if requested. On-site detailed training in the safe and efficient use and general maintenance of item(s) purchased shall be provided as needed at the request of Jefferson County. Instructions and training shall be at no additional cost to the County.

2.8 Storage. Bidder agrees to provide storage of custom ordered materials, if requested, for up to thirty (30) calendar days.

2.9 Compliance with Federal, State, County, and Local Laws. Bids must comply with all federal, state, county and local laws, including, but not limited to, all applicable standard safety, emission, and noise control requirements. Any vehicles or equipment shall contain all standard safety, emission, and noise control requirements required for the types and sizes of equipment at the time of their manufacture. The contractor agrees, during the performance of work or service, to comply with all applicable codes and ordinances of Jefferson County or the State of Texas as they may apply, as these laws may now read, or as they may hereafter be changed or amended.

2.10 OSHA. The bidder will certify all equipment complies with all regulations and conditions stipulated under the Williams-Steiger Occupational Safety and Health Act of 1971, as amended. The successful bidder will further certify that all items furnished under this project will conform and comply with federal and State of Texas OSHA standards. The successful bidder will agree to indemnify and hold harmless Jefferson County for any and all damages that may be assessed against the County.

2.11 Patents and Copyrights. The successful vendor agrees to protect the County from claims involving infringements of patents and/or copyrights.

2.12 Samples, Demonstrations and Testing. At Jefferson County's request and direction, bidder shall provide product samples and/or testing of items bid to ensure compliance with specifications. Samples, demonstrations and/or testing may be requested at any point prior to or following bid award. Samples, demonstrations and/or testing may be requested upon delivery and/or any point during the term of resulting contract. All samples (including return thereof), demonstrations, and/or testing shall be at the expense of the bidder/vendor.

2.13 Acceptability. All articles enumerated in the bid shall be subject to inspection by an officer designated for that purpose by Jefferson County. If found inferior to the quality called for, or not equal in value to the specifications, deficient in workmanship or otherwise, this fact shall be certified to the Purchasing Agent, who shall have the right to reject the whole or any part of the same. Items and/or work determined to be contrary to specifications must be replaced at the vendor's expense. Inferior items not retrieved by the vendor within thirty (30) calendar days, or an otherwise agreed upon time, shall become the property of the County. If disposal of such items warrants an expense, an amount equal to the disposal expense will be deducted from amounts payable to the vendor.

2.14 Maintenance. Maintenance required for equipment bid should be available in Jefferson County by a manufacturer authorized maintenance facility. Cost for this service shall be shown on the bid sheet as requested or on a separate sheet, as required. If Jefferson County opts to include maintenance, it shall be so stated in the purchase order and said cost will be included. Service will commence only upon expiration of applicable warranties and should be priced accordingly.

2.15 Material Safety Data Sheets. Under the "Hazardous Communications Act," common known as the "Texas Right to Know Act," a bidder must provide the user department, with each delivery, material safety data sheets which are applicable to hazardous substances defined in the Act. Failure of the bidder to furnish this documentation, will be cause to reject any bid applying thereto.

2.16 Evaluation. Evaluation shall be used as a determinant as to which services are the most efficient and/or most economical for the County. It shall be based on all factors having a bearing on price and performance of the items in the user environment. All bids are subject to tabulation by the Jefferson County Purchasing Department and recommendation to Jefferson County Commissioners' Court. Compliance with all bid requirements and needs of the using department are considered in evaluating bids. Pricing is not the only criteria for making a recommendation. The Jefferson County Purchasing Department reserves to right to contact any bidder, at any time, to clarify, verify or requirement information with regard to this bid.

3. Purchase Orders and Payment

3.1 Purchase Orders. A purchase order(s) shall be generated by the Jefferson County Purchasing Agent to the successful vendor. The purchase order number must appear on all itemized invoices and packing slips. The County will not be held responsible for any work orders placed and/or performed without a valid current purchase order number. Payment will be made for all ser-

vices rendered and accepted by the contract administrator for which a valid invoice has been received.

3.2 Invoices. All invoices shall reference the Purchase Order number. Invoices shall reference the bid item number or a detailed description for each item invoiced. If an item purchased and itemized on the invoice does not correspond to an item in any of the categories awarded to the vendor, invoice shall reference the item as "N/C" to indicate that it is a non-contract item. This requirement is to assist the County in verifying contract pricing on all invoices. Payment will be made under terms of net thirty (30) days unless otherwise agreed upon by seller and the purchasing department.

3.3 Prompt Payment. In accordance with the State of Texas Prompt Payment Act, Article 601f V.T.C.S., payment will be made after receive and acceptance by the County of the merchandise ordered and of a valid invoice. Successful bidder(s) is required to pay subcontractors within ten (10) days after the successful bidder receives payment from the County.

3.4 Funding. Jefferson County is operated and funded on an October 1 to September 30 basis; accordingly, the County reserves the right to terminate, without liability to the County, any contract for which funding is not available.

4. Contract

4.1 Contract Definition. The General Conditions of Bidding and Terms of Contract, Specifications, Plans, Bidding Forms, Addenda, and any other documents made a part of this bid shall constitute the complete bid. This bid, when duly accepted by Jefferson County, shall constitute a contract equally binding between the successful bidder and Jefferson County.

4.2 Change Order. No different or additional terms will become part of this contract with the exception of a change order. No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing and at the discretion and approval of Jefferson County. No change order will be binding unless signed by an authorized representative of the County and the vendor.

4.3 Price Re-determination. A price re-determination may be requested at the time of annual renewal. All requests for price re-determination shall be in written form. Cause for such request, i.e., manufacturer's direct cost, postage rates, Railroad Commission rates, Federal/State minimum wage law, Federal/State unemployment taxes, F.I.C.A, Insurance Coverage Rates, etc., shall be substantiated in writing by the source of the cost increase. The bidder's past experience of honoring contracts at the bid price will be an important consideration in the evaluation of the lowest and best bid. Jefferson County reserves the right to accept or reject any/all requests for price re-determination as it deems to be in the best interest of the County.

4.4 Termination. Jefferson County reserves the right to terminate the contract for default if the bidder breached any of the terms therein, including warranties of bidder or if the bidder becomes insolvent or commits acts of bankruptcy. Such right of termination is in addition to and not in lieu of any other remedies which Jefferson County may have in law or equity. Default may be construed as, but not limited to, failure to deliver the proper goods and/or service within the proper amount of time, and/or to properly perform any and all services required to Jefferson County's satisfaction and/or to meet all other obligations and requirements. Contracts may be terminated without cause upon thirty (30) days' written notice to either party unless otherwise specified. Jefferson County reserves the right to award canceled contract to the next lowest bidder. Bidder, in submitting this

bid, agrees that Jefferson County shall not be liable to prosecution for damages in the event that the County declares the bidder in default.

4.5 Conflict of Interest. Employees of the County are not permitted to maintain financial interest in, or receive payment, directly or indirectly, borrow from, lend to, invest in, or engage in any substantial financial transaction with any individual, organization, supplier, or subcontractor who does business with the County without disclosure. When conflict of interest is discovered, it shall be grounds for termination of contract.

4.6 Injuries or Damages Resulting from Negligence. Successful vendor shall defend, indemnify and save harmless Jefferson County and all its officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful vendor, or of any agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from bid award. Successful vendor shall pay any judgment with cost which may be obtained against Jefferson County growing out of such injury or damages.

4.7 Interest by Public Officials. No public official shall have interest in this contract, in accordance with Texas Local Government Code.

4.8 Warranty. The successful vendor shall warrant that all materials utilized in the performance of this contract shall conform to the proposed specifications and/or all warranties as stated in the Uniform Commercial Code and be free from all defects in material, workmanship and title.

4.9 Uniform Commercial Code. The successful vendor and Jefferson County agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

4.10 Venue. This agreement will be governed and construed according to the laws of the State of Texas. This agreement is performable in the County of Jefferson, Texas.

4.11 Sale, Assignment, or Transfer of Contract. The successful vendor shall not sell, assign, transfer or convey this contract, in whole or in part, without the prior written consent of Jefferson County.

4.12 Silence of Specifications. The apparent silence of these specifications as to any detailed description concerning any point, shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these specifications shall be made on the basis of this statement.

Special Requirements/Instructions

The following requirements and instructions supersede General Requirements where applicable.

1. Bid Requirement

Each bidder shall ensure that required parts of the bid are completed with accuracy and submitted as per the requirements within this specifications packet, including any addenda.

Bidder is responsible for submitting one (1) *original* bid copy to include a completed copy of this specifications packet in its entirety; and three (3) numbered bid *copies* to include at a minimum all pages requiring completion and/or marked with instructions to be returned with bid submission and any other documentation requested within these specifications.

All bids shall be tightly sealed in an opaque envelope or box and plainly marked "SEALED BID." The outside of the envelope or box shall also include: Bid Number, Bid Name, Bid Due Date, Bidder's Name and Address; and shall be addressed to the Purchasing Agent.

Jefferson County shall not be responsible for any effort or cost expended in the preparation of a response to this IFB. All protests should be coordinated through the Purchasing Office prior to award recommendation to Commissioners' Court.

2. Vendor Registration: SAM (System for Award Management).

Vendors doing business with Jefferson County are **required** to be registered with The System for Award Management (SAM), with an "active" status. The System for Award Management (SAM) is the Official U.S. Government system that consolidated the capabilities of CCR/FedReg, ORCA, and EPLS. There is NO fee to register for this site. Entities may register at no cost directly from the SAM website at: https://www.sam.gov

Bid Respondents are strongly encouraged to review their firm's SAM (System for Award Management) status prior to Bid Submission.

3. Awarded Vendor(s): Submission of FORM 1295 (Texas Ethics Commission)

As of January 1, 2016, per House Bill 1295, the Texas Ethics Commission (TEC) requires **all awarded vendors** to complete a Certificate of Interested Parties (FORM 1295) at time of notification of award. **Awarded Vendors** must visit the TEC website link below, enter the required information on Form 1295, and print a copy of the completed form. The form will include a certification of filing that will contain a unique certification number.

At the time of award, the Jefferson County Purchasing Department will submit a request to the Awarded Vendor to both:

1. Submit FORM 1295 online via the Texas Ethics Commission website link below.

2. Submit a printed copy of FORM 1295, signed by an Authorized Agent of the Awarded Vendor and notarized to the Jefferson County Purchasing Department.

FORM 1295, Completion Instructions, and Login Instructions are available via the Texas Ethics Commission Website at: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

4. Multiple Vendor Award

Jefferson County reserves the right to award this contract to more than one vendor at the County's discretion.

5. Delivery

If delivery is required, all items must be packaged so as to be protected from damage during shipping and handling. Any item(s) damaged in shipping must be replaced in kind, or repaired, by the contractor, at the discretion of, and at no additional charge to, Jefferson County.

6. Payment

Jefferson County will pay original invoices that clearly itemize the goods and/or services provided as to quantity, part number, description, price, applicable discount (if any), labor charges showing time differential, if applicable and if previously agreed to, and delivery, installation, and set-up costs, if applicable and if previously agreed to. Only charges as stated on the Bid Form(s) submitted as a part of the bid will be considered.

Invoices must indicate Jefferson County as applicable, the address to which the product(s) and/or service(s) were delivered, and the applicable purchase order number. Invoices will be matched to delivery tickets prior to payment; therefore, all delivery tickets should have an accurate description of the product(s) and/or service(s).

Invoices shall be submitted to: Jefferson County Auditing Department, Attention: Accounts Payable, 1149 Pearl Street, 7th floor, Beaumont, TX 77701.

7. Usage Reports

Jefferson County reserves the right to request, and receive at no additional cost, up to two (2) times during the contract period, a usage report detailing the products and/or services furnished to date under a contract resulting from this IFB. The reports must be furnished no later than five (5) working days after written request and itemize all purchases to date by Jefferson County department, description of each item purchased, including manufacturer, quantity of each item purchased, per unit and extended price of each item purchased, and total amount and price of all items purchased.

8. Insurance

The contractor (including any and all subcontractors as defined in Section 9.1.3 below) shall, at all times during the term of this contract, maintain insurance coverages with not less than the type and requirements shown below. Such insurance is to be provided at the sole cost of the contractor. These requirements do not establish limits of the contractor's liability.

All policies of insurance shall waive all rights of subrogation against the County, its officers, employees and agents; a copy of the policy wording or endorsement is required.

Contractor shall furnish Jefferson County with Certificate of Insurance naming Jefferson County as additional insured and will provide the actual policy wording or endorsement showing as such.

All insurance must be written by an insurer licensed to conduct business in the State of Texas.

Minimum Insurance Requirements

Public Liability, Including Products & Completed Operations	$1,000,000
Excess Liability	$1,000,000

Property Insurance (policy below that is applicable to this project):
Improvements & Betterments Policy: Improvements/Remodeling (for Lease Tenants)
Builder's Risk Policy: Structural Coverage for Construction Projects
Installation Floater Policy: Improvements/Alterations to Existing Structure

Workers' Compensation Statutory Coverage (see attached)

9. Workers' Compensation Insurance

9.1 Definitions:

9.1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

9.1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

9.1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly

with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

9.2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

9.3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract -- refer to Section 8 above.

9.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

9.5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

9.5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

9.5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

9.6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

9.7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

9.8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on

the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9.9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 9.1. – 9.7., with the certificates of coverage to be provided to the person for whom they are providing services.

9.10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

9.11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

Bidder Information Form

Instructions: Complete the form below. Please provide legible, accurate, and complete contact information. PLEASE PRINT.

Bid Name & Number: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport (IFB 17-024/JW)

Bidder's Company/Business Name: Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company

Bidder's TAX ID Number: 58-1401466

Contact Person: Scott Blanchard **Title:** Asst. Secretary

Phone Number (with area code): (409) 866-1444

Alternate Phone Number if available (with area code): (409) 284-7734

Fax Number (with area code): (409) 866-1032

Email Address: scott.blanachard@oldcastlematerials.com

Mailing Address (Please provide a physical address for bid bond return, if applicable):

12907 US Hwy 90
Address
Beaumont, TX 77713
City, State, Zip Code

OFFER AND ACCEPTANCE FORM

OFFER TO CONTRACT

To Jefferson County:

We hereby offer and agree to furnish the materials or service in compliance with all terms, conditions, specifications, and amendments in the Invitation for Bid and any written exceptions in the offer. We understand that the items in this Invitation for Bid, including, but not limited to, all required certificates are fully incorporated herein as a material and necessary part of the contract.

The undersigned hereby states, under penalty of perjury, that all information provided is true, accurate, and complete, and states that he/she has the authority to submit this bid, which will result in a binding contract if accepted by Jefferson County.

We acknowledge receipt of the following amendment(s): No. 1 , No. 2 , No. 3 , _____.

I certify, under penalty of perjury, that I have the legal authorization to bind the firm hereunder:

Oldcastle Materials Texas, Inc., dba
Gulf Coast an Oldcastle company
Company Name

12907 US Hwy 90
Address

Beaumont TX 77713
City State Zip

Signature of Person Authorized to Sign

Scott Blanchard
Printed Name

Asst. Secretary
Title

For clarification of this offer, contact:

Scott Blanchard
Name

(409) 866-1444 (409) 866-1032
Phone Fax

scott.blanchard@oldcastlematerials.com
E-mail

Bidder Shall Return Completed Form with Offer.

SECTION C
BID FORM AND PROPOSAL

BID FORM AND PROPOSAL

Place Jefferson County

Date August 8, 2017

Proposal of Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company,

a corporation organized and existing under the laws of the State of Delaware,

or

Proposal of N/A,

a partnership consisting of _____

or

Proposal of N/A,

an individual doing business as _____,

To: Jack Brooks Regional Airport

This bid results from your advertisement for bids for the construction of the **Taxiway D Reconstruction (2017), Ware Ramp to Taxiway 'F'.**

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents including all Addenda, and being familiar with all of the conditions relating to the construction of the proposed project, hereby agrees to comply with all other conditions or requirements set forth in the Plans, Specifications, and other Contract Documents, and further proposes to; furnish all material, supplies, equipment, and appliances; to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Plans, Specifications, and other Contract Documents at and for the unit prices proposed in the attached Bid Form(s).

The undersigned Bidder agrees to begin work within ten (10) calendar days after the issuance by, or on behalf of, the Owner of a "Work Order" or "Notice to Proceed" (except as modified in accordance with the GENERAL FAA PROVISIONS of these Contract Documents). Should the work fail to be completed within the time herein stated, the Contractor shall pay to the Owner, as fixed and agreed liquidated damages, and not as a penalty, the sum, for each day of delay until the work is completed and accepted, as stipulated in GENERAL FAA PROVISIONS of these Contract Documents. It is understood that additional time for the completion of the project is to be allowed only for delays as stipulated in GENERAL FAA PROVISIONS of these Contract Documents.

List of Plans

Drawing No.	Title
G-101	COVER SHEET
G-102	SHEET INDEX AND SUMMARY OF QUANTITIES
G-103	GENERAL NOTES
G-201	PROJECT LAYOUT AND SURVEY CONTROL PLAN
G-301	SAFETY AND PHASING PLAN
G-302	SAFETY AND PHASING DETAILS
G-303	SAFETY AND PHASING - PHASE I

Drawing No.	Title
G-304	SAFETY AND PHASING - PHASE II
G-305	SAFETY AND PHASING - PHASE III
G-401	GEOTECHNICAL INVESTIGATION PLAN
C-101	TYPICAL SECTIONS
C-201	SWPPP DETAILS I
C-202	SWPPP DETAILS II
C-203	SWPPP NOTES
C-204	SWPPP LAYOUT
C-301	EXISTING CONDITIONS LAYOUT I
C-302	EXISTING CONDITIONS LAYOUT II
C-401	DEMOLITION DETAILS
C-402	DEMOLITION LAYOUT
C-501	GRADING AND DRAINAGE DETAILS I
C-502	GRADING AND DRAINAGE DETAILS II
C-503	GRADING AND DRAINAGE PLAN I
C-504	GRADING AND DRAINAGE PLAN II
C-601	STORM DRAIN PROFILES AND CALCULATIONS I
C-701	GEOMETRIC PLAN I
C-702	GEOMETRIC PLAN II
C-801	PAVEMENT PROFILE I
C-802	PAVEMENT PROFILE II
C-901	JOINTING DETAILS
C-902	JOINT LAYOUT PLAN I
C-903	JOINT LAYOUT PLAN II
C-1001	JOINT ELEVATIONS LAYOUT I
C-1002	JOINT ELEVATIONS LAYOUT II
M-101	MARKING DETAILS
M-102	MARKING REMOVAL PLAN I
M-103	MARKING REMOVAL PLAN II
M-103	MARKING AND SIGNAGE LAYOUT I
M-104	MARKING AND SIGNAGE LAYOUT II
XS-101	TAXIWAY D CROSS SECTIONS I
XS-102	TAXIWAY D CROSS SECTIONS II
XS-103	TAXIWAY D CROSS SECTIONS III
XS-104	TAXIWAY D CROSS SECTIONS IV
XS-105	TAXIWAY D CROSS SECTIONS V
XS-106	TAXIWAY D CROSS SECTIONS VI
XS-107	TAXIWAY D CROSS SECTIONS VII
XS-108	TAXIWAY D CROSS SECTIONS VIII
XS-109	TAXIWAY D CROSS SECTIONS IX
XS-110	TAXIWAY D CROSS SECTIONS X
XS-111	TAXIWAY D CROSS SECTIONS XI
E-001	ELECTRICAL LEGEND AND NOTES
E-101	LIGHTING REMOVAL PLAN I
E-102	LIGHTING REMOVAL PLAN II

Drawing No.	Title
E-201	LIGHTING INSTALLATION PLAN I
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

Bidder acknowledges receipt of the following addendum (addenda):

Addendum No. 1 dated July 25, 2017

Addendum No. 2 dated August 2, 2017

Addendum No. 3 dated August 4, 2017

The undersigned Bidder agrees that this bid shall be good and shall not be withdrawn for a period of ninety (90) calendar days after the opening thereof. If written notice of the acceptance of this Proposal is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the opening thereof, or at any time thereafter before this Proposal is withdrawn, the undersigned agrees to execute and deliver an Agreement (Contract) in the prescribed form, and furnish the required Performance and Payment Bond, within ten (10) days after the Agreement is presented to him for signature.

It is understood by the undersigned Bidder that the Owner reserves the right to reject any or all bids.

The following provisions are also included by reference:

- Davis Bacon Act (29 CFR Part 5.5)
- EEO Compliance Reports (41 CFR Part 60-1.7)
- Trade Restriction Certification (49 CFR Part 30)
- Buy American Preferences (Title 49 United States Code, Chapter 501)
- Certification of Non-Segregated Facilities (41 CFR Part 60-1.8)
- Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion (49 CFR Part 29)

Accompanying this Proposal as bid security is a certified check/bid bond (*strike one*)

in the amount of Five Percent of Total Bid Amoount Dollars

($5% of Total Bid), being not less than five percent (5%) of the total amount of the bid for the base bid plus additive alternate no. 1 and additive alternate no. 2, as applicable. If the undersigned Bidder is the successful Bidder, but fails or refuses to execute the contract and furnish the required bond within the prescribed ten (10) days of the notification of award, then this bid security is to become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure or refusal.

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$ 55,000.00	$ 55,000.00
	Unit price in words: Fifty Five Thousand dollars and No /100				
SS-120-1	SITE PREPARATION	L.S.	1	$ 310,000.00	$ 310,000.00
	Unit price in words: Three Hundred Ten Thousand dollars and No /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$ 2,150.00	$ 2,150.00
	Unit price in words: Two Thousand One Hundred Fifty dollars and No /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$ 5.10	$ 25,500.00
	Unit price in words: Five dollars and Ten /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$ 1,800.00	$ 1,800.00
	Unit price in words: One Thousand Eight Hundred dollars and No /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$ 1,100.00	$ 3,300.00
	Unit price in words: One Thousand One Hundred dollars and No /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$ 163.00	$ 11,573.00
	Unit price in words: One Hundred Sixty Three dollars and NO/100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$ 1,150.00	$ 2,300.00
	Unit price in words: one Thousand, one Hundred Fifty dollars and NO/100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$ 230.00	$ 230.00
	Unit price in words: Two Hundred Thirty dollars and NO/100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$ 1,140.00	$ 1,140.00
	Unit price in words: One Thousand one Hundred forty dollars and NO/100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$ 1,140.00	$ 1,140.00
	Unit price in words: One Thousand, one Hundred Forty dollars and NO/100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$ 1,050.00	$ 1,050.00
	Unit price in words: One Thousand Fifty dollars and NO/100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$ 890.00	$ 3,560.00
	Unit price in words: Eight Hundred Ninety dollars and NO/100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$ 204.00	$ 3,876.00
	Unit price in words: Two Hundred Four dollars and No /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$ 228.00	$ 912.00
	Unit price in words: Two Hundred Twenty Eight dollars and No /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$ 19.80	$ 12,870.00
	Unit price in words: Nineteen dollars and Eighty /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$ 51.00	$ 20,400.00
	Unit price in words: Fifty One dollars and No /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 5,050.00	$ 20,200.00
	Unit price in words: Five Thousand Fifty dollars and No /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 6,600.00	$ 26,400.00
	Unit price in words: Six Thousand Six Hundred dollars and No /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$ 1,050.00	$ 78,750.00
	Unit price in words: One Thousand Fifty dollars and No /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$ 4,100.00	$ 4,100.00
	Unit price in words: Four Thousand One Hundred dollars and Zero /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$ 775.00	$ 3,875.00
	Unit price in words: Seven Hundred Seventy Five dollars and Zero /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$ 6,100.00	$ 6,100.00
	Unit price in words: Six Thousand One Hundred dollars and zero /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$ 90.00	$ 24,750.00
	Unit price in words: Ninety dollars and Zero /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$ 5,400.00	$ 5,400.00
	Unit price in words: Five Thousand Four Hundred dollars and Zero /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$ 5,400.00	$ 5,400.00
	Unit price in words: Five Thousand Four Hundred dollars and Zero /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$ 11.00	$ 201,905.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Eleven dollars and Zero /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$ 7.70	$ 32,640.30
	Unit price in words: Seven dollars and Seventy /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$ 13.50	$ 30,375.00
	Unit price in words: Thirteen dollars and Fifty /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$ 19.00	$ 104,500.00
	Unit price in words: Nineteen dollars and Zero /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$ 17.00	$ 12,750.00
	Unit price in words: Seventeen dollars and Zero /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$ 19.50	$ 295,854.00
	Unit price in words: Nineteen dollars and Fifty /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$ 7.00	$ 113,113.00
	Unit price in words: Seven dollars and Zero /100				
P-155-2	LIME	TON	600	$ 200.00	$ 120,000.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Two Hundred dollars and Zero /100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$ 23,300.00	$ 23,300.00
	Unit price in words: Twenty Three Thousand Three Hundred dollars and Zero /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$ 82.00	$ 1,177,438.00
	Unit price in words: Eighty Two dollars and ZERO /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$ 2.80	$ 4,200.00
	Unit price in words: Two dollars and Eighty /100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$ 3.90	$ 10,335.00
	Unit price in words: Three dollars and Ninety /100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$ 2.00	$ 8,600.00
	Unit price in words: Two dollars and Zero /100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$ 20,000.00	$ 20,000.00
	Unit price in words: TWENTY THOUSAND dollars and ZERO /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$ 4.60	$ 85,730.20

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Four dollars and Sixty /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$ 1800.00	$ 13,320.00
	Unit price in words: One Thousand Eight Hundred dollars and No /100				
T-904-1	SODDING	S.Y.	1,405	$ 3.60	$ 5,058.00
	Unit price in words: Three dollars and Sixty /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$ 1.65	$ 60,335.55
	Unit price in words: One dollars and Sixty-Five /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$ 9200.00	$ 9,200.00
	Unit price in words: Nine Thousand Two Hundred dollars and No /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$ 15600.00	$ 15,600.00
	Unit price in words: Fifteen Thousand Six Hundred dollars and No /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$ 5.90	$ 1,770.00
	Unit price in words: Fine dollars and Ninety /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$ 1.25	$ 19,000.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: ONE dollars and TWENTY- FIVE /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$ 1.25	$ 8,125.00
	Unit price in words: ONE dollars and TWENTY- FIVE /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$ 3.05	$ 1,067.50
	Unit price in words: THREE dollars and FIVE /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$ 2.55	$ 14,280.00
	Unit price in words: TWO dollars and FIFTY- FIVE /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$ 1.25	$ 189.50
	Unit price in words: ONE dollars and TWENTY- FIVE /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$ 1.25	$ 93.75
	Unit price in words: ONE dollars and TWENTY-FIVE /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$ 8.55	$ 47,880.00
	Unit price in words: EIGHT dollars and FIFTY-FIVE /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$ 10.00	$ 700.00
	Unit price in words: TEN dollars and NO /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$ 10.00	$ 2,250.00
	Unit price in words: TEN dollars and NO /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$ 61.00	$ 16,775.00
	Unit price in words: SIXTY-ONE dollars and NO /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$ 56.00	$ 7,000.00
	Unit price in words: FIFTY-SIX dollars and NO /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700	86.00	60,200.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: EIGHTY - SIX dollars and NO /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$ 780.00	$ 1,560.00
	Unit price in words: SEVEN HUNDRED EIGHTY dollars and NO /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$ 870.00	$ 6,960.00
	Unit price in words: EIGHT HUNDRED SEVENTY dollars and NO /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$ 3800.00	$ 3,800.00
	Unit price in words: THREE THOUSAND EIGHT HUNDRED dollars and NO /100				

TOTAL (BASE BID) $ 3,167,678.80

Total price in words: THREE MILLION ONE HUNDRED SIXTY-SEVEN THOUSAND SIX HUNDRED SEVENTY-EIGHT dollars and EIGHTY /100

08/08/2017 9:38
6900 Jack Brooks TaxiWay D Ware Ramp to F
*** Artie Tucker

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
10	MOBILIZATION	U	1.000	LS	55,000.00	55,000.00
20	SITE PREPARATION	U	1.000	LS	310,000.00	310,000.00
30	LOCKOUT TAGOUT CONSTANT CURRENT	U	1.000	LS	2,150.00	2,150.00
40	NON ENCASED SCH 80 PVC CONDUIT	U	5,000.000	LF	5.10	25,500.00
50	EXISTING CONCRETE MANHOLE REMOVE	U	1.000	EA	1,800.00	1,800.00
60	EXISTING CONCRETE HANDHOLE REMOVED	U	3.000	EA	1,100.00	3,300.00
70	EXISTING STAKE MOUNTED EDGE LIGHT REMOVED	U	71.000	EA	163.00	11,573.00
80	EXISTING BASE MOUNTED EDGE LIGHT REMOVED	U	2.000	EA	1,150.00	2,300.00
85	EXISTING BASE MOUNTED EDGE LIGHT REMOVED	U	1.000	EA	230.00	230.00
90	ABANDONED WIND CONE BASE REMOVED	U	1.000	EA	1,140.00	1,140.00
100	EXISTING WIND CONE & FDN REMOVED	U	1.000	EA	1,140.00	1,140.00
110	EXISTING SEGMENTED CIRCLE MRKR REMOVED	U	1.000	EA	1,050.00	1,050.00
120	ABANDONED SIGN BASE REMOVED	U	4.000	EA	890.00	3,560.00
130	EXISTING BASE MOUNTED GUIDANCE SIGN REMOVED	U	19.000	EA	204.00	3,876.00
140	EXIST BASE MNTD GUIDANCE SIGN RMVD BASE TO REMAIN	U	4.000	EA	228.00	912.00
150	CONCRETE ENCASED DUCT BANK REMOVAL	U	650.000	LF	19.80	12,870.00
160	DIRECRTIONAL BORING 2" CONDUIT	U	400.000	LF	51.00	20,400.00
170	L-858(L) BASE MOUNTED 2-GUIDANCE INSTALLED	U	4.000	EA	5,050.00	20,200.00
180	L-858(L) BASE MOUNTED 3-GUIDANCE INSTALLED	U	4.000	EA	6,600.00	26,400.00
190	L-861(L) BASE MOUNTED TAXIWAY EDGE LGHT INSTALLED	U	75.000	EA	1,050.00	78,750.00
200	L-852T(L) LOW PROFILE BASE IN PVMNT EDGE LIGHT INS	U	1.000	EA	4,100.00	4,100.00
210	FIELD LIGHTING ARRESTOR	U	5.000	EA	775.00	3,875.00
220	VEHICLE SIGN ASSEMBLY	U	1.000	LS	6,100.00	6,100.00
230	18" RCP	U	275.000	LF	90.00	24,750.00
240	4X4 SINGLE GRATE INLET	U	1.000	EA	5,400.00	5,400.00
250	4X4 JUNCTION BOX	U	1.000	EA	5,400.00	5,400.00
260	CONCRETE PAVMNT REMOVAL	U	18,355.000	SY	11.00	201,905.00
270	MILLING & REMOVAL OF ASPHALT 4"	U	4,239.000	SY	7.70	32,640.30
280	UNCLASSIFIED EXCAVATION	U	2,250.000	CY	13.50	30,375.00
290	BORROW EXCAVATION	U	5,500.000	CY	19.00	104,500.00
300	UNSUITABLE EXCAVATION	U	750.000	CY	17.00	12,750.00
310	8" SUBBASE COURSE	U	15,172.000	SY	19.50	295,854.00
320	16" LIME TREATED SUBGRADE	U	16,159.000	SY	7.00	113,113.00
330	LIME	U	600.000	TON	200.00	120,000.00
340	TEMPORARY EROSION CONTROL	U	1.000	LS	23,300.00	23,300.00
350	12.5" CONCRETE PAVMNT	U	14,359.000	SY	82.00	1,177,438.00
360	CONCRETE JOINT CLEAN & SEAL	U	1,500.000	LF	2.80	4,200.00
370	RETRO REFLECTIVE PVMNT MARKINGS	U	2,650.000	SF	3.90	10,335.00
380	NON REFLECTIVE BLACK OUTLINE	U	4,300.000	SF	2.00	8,600.00

BID TOTALS

Biditem	Description	Status - Rnd	Quantity	Units	Unit Price	Bid Total
390	PAVEMENT MARKING REMOVAL	U	1.000	LS	20,000.00	20,000.00
400	REEFINED COAL TAR EMULSION SLURRY COAT	U	18,637.000	SY	4.60	85,730.20
410	SEEDING INCLUDING FERTILIZING & WATER	U	7.400	AC	1,800.00	13,320.00
420	SODDING	U	1,405.000	SY	3.60	5,058.00
430	TOPSOILING OBTAINED ONSITE 2"	U	36,567.000	SY	1.65	60,335.55
440	L-807(L) STYLE I-B SIZE 2 WIND CONE& FOUNDATION	U	1.000	EA	9,200.00	9,200.00
450	SEGEMENTED CIRCLE MARKER	U	1.000	EA	15,600.00	15,600.00
460	TRENCHING FOR DIRECT BURIED CABLE	U	300.000	LF	5.90	1,770.00
470	NO. 8 AWG 5KV L-824 TYPE C CABLE	U	15,200.000	LF	1.25	19,000.00
580	NO. 6 AWG SOLID BARE COUNTERPOISE WIRE	U	6,500.000	LF	1.25	8,125.00
590	NO. 1/0 AWG STRANDED BARE COUNTERPOISE WIRE	U	350.000	LF	3.05	1,067.50
600	TRENCHING FOR DIRECT BURIED WIRE 8"	U	5,600.000	LF	2.55	14,280.00
610	NO. 6 AWG STRANDED 600V RATED THHN/THWN-2 CABLE	U	150.000	LF	1.25	187.50
620	NO. 8 AWG STRANDED 600 V THHN/THWN-2 GREEN	U	75.000	LF	1.25	93.75
630	NON ENCASED ELECTRIC CONDUIT 1WAY-2"C	U	5,600.000	LF	8.55	47,880.00
640	NON ENCASED ELECTRIC DUCTBANK 2WAY-2C	U	70.000	LF	10.00	700.00
650	NON ENCASED SCHEDULE 40 PVC 1-WAY 2"C	U	225.000	LF	10.00	2,250.00
660	ENCASED ELECTRIC CONDUIT 1 WAY 2"C W/FLOWFILL	U	275.000	LF	61.00	16,775.00
670	CONCRETE ENCASED ELECTRIC DUCTBANK 2-WAY 2"C	U	125.000	LF	56.00	7,000.00
680	FAA STYLE CONCRETE ENCASED SPLIT DUCT 1-WAY 3"C	U	700.000	LF	86.00	60,200.00
690	CONCRETE ENCASED ELECTRIC JUNCTION STRUCTURE 24"	U	2.000	EA	780.00	1,560.00
700	CONCRETE ENCASED ELCTRIC JUNCTION STRUCTURE 16"	U	8.000	EA	870.00	6,960.00
710	FAA STYLE PRECAST CONCRETE HANDHOLE	U	1.000	EA	3,800.00	3,800.00
			Bid Total ⟹			$3,167,678.80

It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

Bid Affidavit

The undersigned certifies that the bid prices contained in this bid have been carefully reviewed and are submitted as correct and final. Bidder further certifies and agrees to furnish any and/or all commodities upon which prices are extended at the price offered, and upon the conditions contained in the specifications and the Notice to Bidders.

STATE OF Texas COUNTY OF Jefferson

BEFORE ME, the undersigned authority, a Notary Public in and for the State of Texas,

on this day personally appeared Scott Blanchard (name), who

after being by me duly sworn, did depose and say:

"I, Scott Blanchard (name) am a duly authorized officer of/agent

for Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company (name of firm) and have been duly authorized to execute the

foregoing on behalf of the said Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company (name of firm)

I hereby certify that the foregoing bid has not been prepared in collusion with any other bidder or other person or persons engaged in the same line of business prior to the official opening of this bid. Further, I certify that the bidder is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities bid on, or to influence any person or persons to bid or not to bid thereon."

Name and address of bidder: Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company

12907 US Hwy 90, Beaumont, TX 77713

Fax: (409) 866-1032 Telephone# (409) 866-1444

by: Scott Blanchard (print name) Title: Asst. Secretary

Signature:

SUBSCRIBED AND SWORN to before me by the above-named Scott Blanchard on

this the 8th day of August, 2017.

PAULA HARRIS
Notary ID #1179575
My Commission Expires
May 9, 2021

Notary Public in and for the State of Texas

Bidder Shall Return Completed Form with Offer.

SECTION D
STATEMENT OF BIDDER'S QUALIFICATIONS

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company
2. Permanent main office address
   12907 US Hwy 90, Beaumont, TX 77713
3. When organized 1945
4. If a corporation, where incorporated 1980
5. How many years have been engaged in the contracting business under your present firm or trade name? 72
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion)
   Please see attached

General character of work performed by your company

7. Have you ever failed to complete any work awarded to you? No
8. Have you ever defaulted on a Contract? No
   If so, where and why?
9. Have you ever been fined or had your license suspended by a Contractor's Licensing Board? No
   If so, where and why?
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed (attach to back of this document).
11. List your major equipment available for this Contract (attach to back of this document).
12. List your experience in construction work similar in scope and scale to this project (attach to back of this document).
13. Background and experience of the principal members of your organization, including the officers (attach to back of this document).
14. Credit available: $ Available upon request
15. Give Bank reference: Bank of America, Lois Marshall, FAX: (415) 343-9310

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? Yes

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner, in verification of the recitals comprising this statement of Bidder's Qualifications.

The Bidder shall provide a brief description of any litigation or administrative proceeding of the following types, either pending or concluded within the proceeding year, to which the Bidder (and the ultimate controlling person, if different from the Bidder) or any of its directors or executive officers was a party or of which the property of any such person is or was the subject; the names of the parties and the court or agency in which such litigation or proceeding is or was pending shall be given:

(a) Administrative or judicial proceedings of any state federal agency or authority concerning environmental violations;

(b) Proceedings which may have a material effect upon the solvency of the ultimate holding company, including but not necessarily limited to, bankruptcy and receivership; and

(c) Criminal proceedings.

Dated at Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company this 8th day of August, 20 17.

Oldcastle Materials Texas, Inc., dba
Gulf Coast an Oldcastle company
(Name of Bidder)
By
Title Asst. Secretary

STATE OF Texas)
) §.
COUNTY OF Jefferson)

Scott Blanchard being duly sworn deposes and says that he is Asst. Secretary of Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company (Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

SUBSCRIBED AND SWORN TO BEFORE ME this 8th day of August, 20 17.

(Notary Public)

My Commission Expires: May 9, 2021

PAULA HARRIS
Notary ID #1179575
My Commission Expires
May 9, 2021

Bidder Shall Return Completed Statement with Offer.

CONFLICT OF INTEREST QUESTIONNAIRE

CONFLICT OF INTEREST QUESTIONNAIRE **FORM CIQ**
For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session. This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a). By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code. A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.	**OFFICE USE ONLY** Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information in this section is being disclosed.**

_____
Name of Officer

This section (item 3 including subparts A, B, C, & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more?

☐ Yes ☐ No

D. Describe each employment or business and family relationship with the local government officer named in this section.

4

_____ _____
Signature of vendor doing business with the governmental entity Date

Bidder Shall Return Completed Form with Offer.

LOCAL GOVERNMENT OFFICER
CONFLICTS DISCLOSURE STATEMENT – (OFFICE USE ONLY)

LOCAL GOVERNMENT OFFICER CONFLICTS DISCLOSURE STATEMENT

FORM CIS

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This is the notice to the appropriate local governmental entity that the following local government officer has become aware of facts that require the officer to file this statement in accordance with Chapter 176, Local Government Code.

OFFICE USE ONLY

Date Received

1 **Name of Local Government Officer**

2 **Office Held**

3 **Name of vendor described by Sections 176.001(7) and 176.003(a), Local Government Code**

4 **Description of the nature and extent of employment or other business relationship with vendor named in item 3**

5 **List gifts accepted by the local government officer and any family member, if aggregate value of the gifts accepted from vendor named in item 3 exceeds $100 during the 12-month period described by Section 176.003(a)(2)(B).**

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

(attach additional forms as necessary)

6 **AFFIDAVIT**

I swear under penalty of perjury that the above statement is true and correct. I acknowledge that the disclosure applies to each family member (as defined by Section 176.001(2), Local Government Code) of this local government officer. I also acknowledge that this statement covers the 12-month period described by Section 176.003(a)(2)(B), Local Government Code.

_____
Signature of Local Government Officer

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20_____, to certify which, witness my hand and seal of office.

_____ Signature of officer administering oath

_____ Printed name of officer administering oath

_____ Title of officer administering oath

Adopted 8/7/2015

Vendor References

Please list at least three (3) companies or governmental agencies (preferably a municipality) where the same or similar products and/or services as contained in this specification package were recently provided.

THIS FORM MUST BE RETURNED WITH YOUR BID.

REFERENCE ONE

Government/Company Name: Texas Department of Transportation

Address: 8450 Eastex Freeway, Beaumont, TX 77708

Contact Person and Title: Kenneth Wiemers, Area Engineer

Phone: (409) 924-6521 Fax:

Email Address: kenneth.wiemers@txdot.gov Contract Period:

Scope of Work:

REFERENCE TWO

Government/Company Name: Schaumburg & Polk, Inc.

Address: 8865 College Street, Suite 100, Beaumont, TX 77707

Contact Person and Title: Ricky Borque

Phone: (409) 866-0341 Fax: (409) 866-0337

Email Address: rbourque@spi-eng.com Contract Period:

Scope of Work:

REFERENCE THREE

Government/Company Name: Crabtree Barricade Systems, Inc.

Address: P.O. Box 20195, Beaumont, TX 77720

Contact Person and Title: Guy Crabtree, Vice President

Phone: (409) 842-5010 Fax: (409) 842-0593

Email Address: ddiste5713@gt.rr.com Contract Period:

Scope of Work: _____

Bidder Shall Return Completed Form with Offer.

SECTION E
DBE PARTICIPATION AND RESIDENCE CERTIFICATION REPORTING

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☑ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company DBE: ☐ Yes ☑ No

Address: 12907 US Hwy 90 (Street) Beaumont (City) TX (State) 77713 (Zip)

Phone (with area code): (409) 866-1444 Fax (with area code): (409) 866-1032

Project Title & No.: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport - IFB 17-024/JW

Prime Contract Amount: $ _____

DBE Subcontractor Name: To Be Determined

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____ (Street) _____ (City) _____ (State) _____ (Zip)

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Printed Name of Contractor Representative	Signature of Representative	Date
Printed Name of DBE	Signature of Representative	Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☑ Yes ☐ No

Prime Contractor: Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company DBE: ☐ Yes ☑ No

DBE Status (Gender & Ethnicity): N/A

Address: 12907 US Hwy 90 (Street) Beaumont (City) TX (State) 77713 (Zip)

Phone (with area code): (409) 866-1444 Fax (with area code): (409) 866-1032

Project Title & No.: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport IFB/RFP No.: IFB 17-024/JW

Total Contract: $ Total DBE Subcontract(s): $

Construction DBE Goals: 12.62% DBE:: %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: Initials:

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: To Be Determined

DBE Status (Gender & Ethnicity):

Certifying Agency:

Address: (Street) (City) (State) (Zip)

Contact person: Title:

Phone (with area code): Fax (with area code):

Proposed Subcontract Amount: $ Percentage of Prime Contract: %

Description of Subcontract Work to be Performed:

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____%

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☑ Other: Ongoing negotiations with potential Subcontractors

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☑ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company

Address: 12907 US Hwy 90 (Street) Beaumont (City) TX (State) 77713 (Zip)

Contact person: Scott Blanchard Title: Asst. Secretary

Phone (with area code): (409) 866-1444 Fax (with area code): (409) 866-1032

Proposed Subcontract Amount: $ Percentage of Prime Contract: %

Description of Subcontract Work to be Performed:

Subcontractor Name: To Be Determined

Address: (Street) (City) (State) (Zip)

Contact person: Title:

Phone (with area code): Fax (with area code):

Proposed Subcontract Amount: $ Percentage of Prime Contract: %

Description of Subcontract Work to be Performed:

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required.** I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): Scott Blanchard

Title: Asst. Secretary

Signature: _____

Date: August 8, 2017

E-mail address: scott.blanchard@oldcastlematerials.com

Contact person that will be in charge of invoicing for this project:

Name (print or type): Scott Blanchard

Title: Asst. Secretary

Date: August 8, 2017

E-mail address: scott.blanchard@oldcastlematerials.com

Bidder Shall Return Completed Form with Offer.

GOOD FAITH EFFORT (GFE) DETERMINATION CHECKLIST

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☑ Yes ☐ No

Instructions: In order to determine if a "Good Faith Effort" was made in soliciting DBEs for subcontracting opportunities, the following checklist and supporting documentation shall be completed by the Prime Contractor/Consultant, and returned with the Prime Contractor/ Consultant's bid. This list contains the **minimum** efforts that should be put forth by the Prime Contractor/Consultant when attempting to achieve or exceed the goals of DBE Subcontractor participation. The Prime Contractor/Consultant may extend his/her efforts in soliciting DBE Subcontractor participation beyond what is listed below.

Did the Prime Contractor . . .

☑ Yes	☐ No	1. To the extent practical, and consistent with standard and prudent industry standards, divide the contract work into the smallest feasible portions, to allow for maximum DBE Subcontractor participation?
☑ Yes	☐ No	2. **Notify** in writing a reasonable number of DBEs, allowing sufficient time for effective participation of the planned work to be subcontracted?
☑ Yes	☐ No	3. **Provide** DBEs that were genuinely interested in bidding on a subcontractor, adequate information regarding the project (i.e., plans, specifications, scope of work, bonding and insurance requirements, and a point of contract within the Prime Contractor/Consultant's organization)?
☑ Yes	☐ No	4. **Negotiate** in good faith with interested DBEs, and not reject bids from DBEs that qualify as lowest and responsive bidders?
☑ Yes	☐ No	5. **Document** reasons DBEs were rejected? Was a written rejection notice, including the reason for rejection, provided to the rejected DBEs?
☐ Yes	☑ No	6. If Prime Contractor/Consultant has zero (0) DBE participation, **please explain the reasons why.**

If "No" was selected, please explain and include any pertinent documentation with your bid.
If necessary, please use a separate sheet to answer the above questions.

Scott Blanchard
Printed Name of Authorized Representative

Signature

Asst. Secretary
Title

August 8, 2017
Date

Bidder Shall Return Completed Form with Offer.

RESIDENCE CERTIFICATION/TAX FORM

Pursuant to Texas Government Code §2252.001 *et seq.*, as amended, Jefferson County requests Resident Certification. §2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of §2252.001 are stated below:

(3) "Nonresident bidder" refers to a person who is not a resident.

(4) "Resident bidder" refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

☐ I certify that Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company [company name] is a Resident Bidder of Texas as defined in Government Code §2252.001.

☐ I certify that _____ [company name] is a Nonresident Bidder as defined in Government Code §2252.001 and our principal place of business is _____ _____ (city and state).

Taxpayer Identification Number (T.I.N.):	1-58-1401466-6
Company Name submitting bid/proposal:	Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company
Mailing address:	P.O. Box 20779, Beaumont, TX 77720
If you are an individual, list the names and addresses of any partnership of which you are a general partner:	

Property: List all taxable property owned by you or above partnerships in Jefferson County.

Jefferson County Tax Acct. No.*	Property address or location**

* This is the property amount identification number assigned by the Jefferson County Appraisal District.

** For real property, specify the property address or legal description. For business property, specify the address where the property is located. For example, office equipment will normally be at your office, but inventory may be stored as a warehouse or other location.

Bidder Shall Return Completed Form with Offer.

SECTION F
BID SURETY

Liberty Mutual

Interchange Corporate Center
450 Plymouth Road, Suite 400
Plymouth Meeting, PA 19462-1644
PH. (610) 832-8240

BID BOND

Bond Number: 7591077

KNOW ALL MEN BY THESE PRESENTS, that we Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company

as Principal, (the "Principal"), and LIBERTY MUTUAL INSURANCE COMPANY, a mutual company duly organized under the laws of the Commonwealth of Massachusetts as Surety, (the "Surety"), are held and firmly bound unto Jefferson County, Texas Purchasing Department

as Obligee, (the "Obligee"), in the penal sum of FIVE PERCENT OF AMOUNT BID

Dollars ($5% OF AMOUNT BID),

for the payment of which sum well and truly to be made, the Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport, IFB 17-024/JW

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal within the period specified therein, or, if no period be specified, within sixty (60) days after opening, and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or contract documents, or in the event of the failure of the Principal to enter into such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference in money not to exceed the penal sum hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. In no event shall the liability hereunder exceed the penal sum hereof.

DATED as of this 8th day of August, 2017.

WITNESS/ATTEST:

Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company (Seal)
Principal

By: _____
Name: Scott Blanchard
Title: Asst. Secretary

LIBERTY MUTUAL INSURANCE COMPANY (Seal)
Surety

By: _____
Artie Tucker, Attorney-in-Fact

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.
This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7591077

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Angela Kvarme; Artie Tucker; Chad Helton; David Barlow; Josh Houston; Kal A. Kincaid; L.L. Mathews, Jr.; Larry Mathews; Nick Shack; Scott Blanchard

all of the city of Beaumont, state of TX each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all bid bonds on behalf of Oldcastle Materials Texas, Inc. dba Gulf Coast

and the execution of such bid bonds, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 11th day of January, 2017.

The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 11th day of January, 2017, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2017
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 8th day of August, 2017.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

SURETY ACKNOWLEDGMENT

STATE OF Texas }
COUNTY OF Jefferson } **SS**

On this 8th day of August, 2017, before me personally came Artie Tucker to me known, who, being by me duly sworn, did depose and say that he is an Attorney-In-Fact of LIBERTY MUTUAL INSURANCE COMPANY the corporation described in and which executed the within instrument; that he knows the corporate seal of said corporation, that the seal affixed to the within instrument is such corporate seal, and that he signed the said instrument and affixed the said seal as Attorney-In-Fact of the Board of Directors of said corporation and by authority of this office under the Standing Resolutions thereof.

NOTARY PUBLIC STATE OF TEXAS
PAULA HARRIS
Notary ID #1179575
My Commission Expires
May 9, 2021

Notary Public

ACTION BY WRITTEN CONSENT
OF THE BOARD OF DIRECTORS
OF
OLDCASTLE MATERIALS TEXAS, INC.

The undersigned, being all of the members of the Board of Directors of Oldcastle Materials Texas, Inc., a Delaware corporation (the "***Corporation***"), do hereby, pursuant to applicable Delaware statute, give this written consent to the taking of the following actions, such actions to have the same force and effect had a meeting been duly called and held:

RESOLVED, that effective November 8, 2016 all previous elections of officers are terminated, and the following persons be, and hereby are, elected to serve as officers of the Corporation (each individually, an ***"Officer"*** and collectively, the ***"Officers"***) in the capacities set forth opposite their respective names until such time as their successors shall be elected and qualified:

Brandon Smith	President
Stephen Ross	Secretary/Asst. Treasurer
Kal A. Kincaid	Vice President/Assistant Secretary
Joe Naivar, Jr.	Vice President/Assistant Secretary
Eric Bailey	Vice President/Assistant Secretary
Jake Parson	Vice President/Assistant Secretary
Nicholas Schack	Vice President/Assistant Secretary
Hugh Franklin	Vice President – Finance
William B. Miller	Admin. Vice President/Assistant Secretary
Charles Brown	Treasurer/Assistant Secretary
Robert Banks	Assistant Secretary

FURTHER RESOLVED, that the Officers be, and each of them hereby is, authorized to execute and deliver agreements, contracts, documents, certificates, and other instruments, under the seal of the Corporation if required, for the purpose of conducting the Corporation's business, including without limitation, selling products and securing construction work, and to take such other action, as they may deem necessary, advisable, convenient, or appropriate to carry out and fully perform duties incident to the office or offices so appointed, and such other duties as may be prescribed by the Board of Directors from time to time;

FURTHER RESOLVED, that the following persons are hereby designated Officers solely for the purpose of attesting signatures of other Officers signing on behalf of the Corporation, and for executing and attesting various corporate documents, tax returns, affidavits, and other instruments as may be necessary from time to time:

Angela Kvarme	Assistant Secretary/Assistant Treasurer
Kristin Davis	Assistant Secretary/Assistant Treasurer
Chris Michael	Assistant Secretary/Assistant Treasurer
Ben Liggett	Assistant Secretary
Scott Blanchard	Assistant Secretary

Larry Matthews	Assistant Secretary
Michael F. Deaton	Assistant Secretary
Mike Wallace	Assistant Secretary
Dean W. Buchanan	Assistant Secretary
Gary P. Hickman	Assistant Secretary
Michael G. O'Driscoll	Assistant Secretary
M. Craig Hall	Assistant Secretary
David M. Toolan	Assistant Secretary
David Lewis	Assistant Secretary
David Young	Assistant Secretary

FURTHER RESOLVED, that effective November 8, 2016 all previous appointments of authorized employees are terminated, and that the following persons be and each of them hereby is appointed to serve as an authorized employee of the Corporation, which persons shall be authorized to execute and deliver such agreements, contracts, documents, certificates and other instruments, under the seal of the Corporation if required, for the purpose of conducting the Corporation's business including, without limitation, selling products and securing construction work:

Robert Brown	Ryan Lindsey	Lance Phillips
Mike Brown	L.L. Matthews	David Reese
James A. Connor	Rebecca Rutledge	Barry Egbert
Dean Donnellan	Greg Morisey	Josh Houston
Stephen Koonce	Kirk Morris	

FURTHER RESOLVED, that the President of the Corporation may, from time to time, without further action by the Board of Directors, appoint other persons to serve as authorized employees, or remove any individuals from this capacity, and to direct those appointed to take such action, as he may deem necessary, advisable, convenient or appropriate to carry out and fully perform the duties incident to the office of President;

FURTHER RESOLVED, that all actions previously taken by any Officer of the Corporation appointed hereunder in his/her capacity as such Officer be, and each of them hereby is, adopted, ratified, confirmed and approved in all respects as the authorized acts and deeds of the Corporation;

FURTHER RESOLVED, that each undersigned agrees that electronic signatures, whether digital or encrypted, of the Board of Directors are intended to authenticate this consent and to have the same force and effect as manual signatures. As used in the previous sentence, the term "electronic signatures" means any electronic sound, symbol or process attached to or logically associated with this consent and executed and adopted by a member of the Board of Directors with the intent to sign such consent, including, but not limited to, e-mail electronic signatures executed through Adobe® eSign Services; and

FURTHER RESOLVED, that this Consent, following execution by all of the members of the Board of Directors, be filed in appropriate order in the minute book of the Corporation.

Signature: Brandon J Smith (Nov 14, 2016)

Email: brandon.smith@oldcastlematerials.com

Signature: Nathan Creech (Nov 14, 2016)

Email: nathan.creech@oldcastlematerials.com

Signature: John J. Keating (Nov 14, 2016)

Email: jkeating@oldcastlematerials.com

APAC-TEXAS, INC. AND SUBSIDIARIES

(An indirect, wholly owned subsidiary of CRH plc)
Dallas, Texas

CONSOLIDATED FINANCIAL STATEMENTS

January 2, 2016

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
Dallas, Texas

CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

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Crowe Horwath LLP
Independent Member Crowe Horwath International

INDEPENDENT AUDITOR'S REPORT

Board of Directors and Stockholder
APAC-Texas, Inc. and Subsidiaries
Dallas, Texas

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of APAC-Texas, Inc. and Subsidiaries (the Company), which comprise the consolidated balance sheet as of January 2, 2016, and the related consolidated statements of income, stockholder's equity and cash flows for the year then ended, and related notes to the financial statements.

Management's Responsibility for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principals generally accepted in the United States of America; this includes the design implementation, and maintenance of internal control relevant to the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risk of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

(Continued)

Opinion

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of APAC-Texas, Inc. and Subsidiaries as of January 2, 2016, and the results of their operations and their cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matter

Our audit was conducted for the purpose of forming an opinion on the consolidated financial statements as a whole. The accompanying Contractor's Consolidated Financial Statement, Details Relative to Assets, Details Relative to Liabilities, Details Relative to Stockholder's Equity, Contracts in Progress and Work Completed, and Consolidated Schedule of General and Administrative Expenses is presented for purposes of additional analysis and is not a required part of the consolidated financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the consolidated financial statements. The information has been subjected to the auditing procedures applied in the audit of the consolidated financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the consolidated financial statements or to the consolidated financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the information is fairly stated in all material respects in relation to the consolidated financial statements as a whole.

Crowe Horwath LLP

Crowe Horwath LLP

Dallas, Texas
March 21, 2016

I, Marcus McKerley, do affirm that I am an independent certified public accountant holding unrevoked license number CPA 095611 in the State of Texas. I have signed the opinion above as a member of the firm Crowe Horwath LLP.

Marcus A. McKerley

Certified Public Accountant

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
CONSOLIDATED BALANCE SHEET
January 2, 2016

ASSETS	
Current assets	
Cash	$ 2,677,107
Accounts receivable less allowance for doubtful accounts of $1,046,119	46,690,981
Costs and estimated earnings in excess of billings on uncompleted contracts	11,089,308
Inventories, net	25,300,359
Prepaid expenses	4,141,992
Deferred tax assets	2,422,000
Due from parent	14,111,653
Total current assets	106,433,400
Property, plant, and equipment	
Land, buildings, and improvements	44,176,107
Machinery and equipment	227,958,499
	272,134,606
Total accumulated depreciation	(89,676,371)
Net property, plant, and equipment	182,458,235
Other non-current assets	
Goodwill	192,047,264
Intangibles, net	4,423,339
Other assets	6,172,209
Total other non-current assets	202,642,812
Total assets	$ 491,534,447

See accompanying notes to consolidated financial statements.

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
CONSOLIDATED BALANCE SHEET
January 2, 2016

LIABILITIES AND STOCKHOLDER'S EQUITY	
Current liabilities	
Trade and other payables	$ 50,986,888
Billings in excess of costs and estimated earnings on uncompleted contracts	7,982,966
Total current liabilities	58,969,854
Long-term liabilities	
Deferred tax liabilities	42,778,000
Long-term debt due to parent	328,345,702
Other long-term liabilities	87,595
Total long-term liabilities	371,211,297
Stockholder's equity	
Common stock, no par value; 1,000 shares authorized and 10 shares issued and outstanding (100% owned by APAC Holdings, Inc.).	-
Retained earnings	61,353,296
Total stockholder's equity	61,353,296
Total liabilities and stockholder's equity	$ 491,534,447

See accompanying notes to consolidated financial statements.

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
CONSOLIDATED STATEMENT OF INCOME
Year ended January 2, 2016

Revenue	
Construction revenue and sale of construction materials	$ 480,271,169
Cost of revenue and operating expenses	
Cost of revenue earned	353,363,611
General and administrative expenses	56,430,950
Depreciation and amortization	19,628,078
Total cost of revenue and operating expenses	429,422,639
Operating income	50,848,530
Other expenses	
Interest expense	17,958,287
Loss on investment	227,791
Other expenses	1,071,850
Total other expenses	19,257,928
Income before income taxes	31,590,602
Provision for income taxes	12,733,061
Net income	$ 18,857,541

See accompanying notes to consolidated financial statements.

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
CONSOLIDATED STATEMENT OF STOCKHOLDER'S EQUITY
Year ended January 2, 2016

	Shares	Common Stock	Retained Earnings	Total Stockholder's Equity
Balances, December 28, 2014	10	$ -	$ 42,495,755	$ 42,495,755
Net Income	-	-	18,857,541	18,857,541
Balances, January 2, 2016	10	$ -	$ 61,353,296	$ 61,353,296

See accompanying notes to consolidated financial statements.

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
CONSOLIDATED STATEMENT OF CASH FLOWS
Year ended January 2, 2016

Cash flows from operating activities	
Net income	$ 18,857,541
Adjustments to reconcile net income to net cash from operating activities:	
Depreciation and amortization	19,628,078
Deferred income taxes	10,143,000
Loss on investment	227,791
Adjustment to goodwill for prior year acquisition of business	(4,994)
Net gain on sale of equipment	109,171
Changes in operating assets and liabilities:	
Accounts receivable	(9,428,118)
Costs and estimated earnings in excess of billings on uncompleted contracts	(4,518,839)
Inventories, net	(3,562,388)
Prepaid expenses	(1,348,422)
Due from parent	6,859,779
Other assets	533,081
Trade and other payables	10,306,649
Billings in excess of costs and estimated earnings on uncompleted contracts	682,024
Other long-term liabilities	(330,825)
Net cash from operating activities	48,153,528
Cash flows from investing activities	
Acquisition of businesses	(25,083,474)
Investment in Asphalt Inc., LLC	(6,400,000)
Purchases of property, plant, and equipment	(38,218,997)
Proceeds from sale of property, plant, and equipment	1,469,965
Net cash from investing activities	(68,232,506)
Cash flows from financing activities	
Change in amounts due to parent	22,189,605
Net cash from financing activities	22,189,605
Net change in cash	2,110,627
Cash at beginning of year	566,480
Cash at end of year	$ 2,677,107

See accompanying notes to consolidated financial statements.

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 1 - NATURE OF OPERATIONS

APAC-Texas, Inc. and Subsidiaries (the Company) is a domestic construction company that is a subsidiary of APAC Holdings, Inc., a division of CRH plc. A significant portion of the Company's business, including accounts receivable and construction completed and in progress, is derived through contracts with local, state, and federal governments for work performed primarily in Texas. The Company also serves a number of transportation and other agencies, industrial, commercial and residential owners, and developers. The Company's principal activities are paving and base construction, road resurfacing, repair and asphalt maintenance, production of asphalt, concrete and aggregates for sale, and site development for excavating and preparing commercial, industrial and residential areas.

On June 10, 2014, Oldcastle Paving Solutions, LLC was formed as a wholly owned subsidiary of the Company. The subsidiary conducts activities primarily within the state of Texas.

On April 7, 2014, Oldcastle Materials Texas Production Assets Company, LLC ("OMTPAC"") was formed as a wholly owned subsidiary of the Company. OMTPAC conducts activities primarily within the state of Texas.

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Principles of Consolidation: The consolidated financial statements present the financial position and results of operations of APAC-Texas, Inc. and its wholly-owned subsidiaries, Oldcastle Paving Solutions, LLC and Oldcastle Materials Texas Production Assets Company, LLC. All significant intercompany transactions and accounts have been eliminated in the consolidated financial statements.

Fiscal Year: The Company operates on a 52-53 week fiscal year ending on the Saturday closest to December 31.

Use of Estimates: The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Significant estimates used in preparing these financial statements include the stage of completion of construction contracts, estimate of loss projects, allowances for doubtful accounts, mineral rights, asset retirement obligations, reserve for excess inventory, recoverability of goodwill, deferred income taxes, useful lives of depreciable assets, and certain accrued expenses. Actual results could differ from the estimates and assumptions used.

Concentration of Credit Risk: The Company maintains its cash accounts in various deposit accounts, the balances of which are periodically in excess of federally insured limits.

Operating Cycle: In accordance with industry practice, contract-related assets and liabilities that are realizable or payable over periods in excess of one year are recorded as current assets and liabilities.

Revenue Recognition: The Company recognizes revenue on sales of materials when products are delivered to its customers. The Company recognizes revenue from construction projects on the percentage-of-completion method. Under this method, revenue is recognized as construction contracts are completed based on costs incurred to date relative to the estimated total costs of the contracts. The asset, "Costs and estimated earnings in excess of billings on uncompleted contracts," represents revenues recognized in excess of billings. The liability, "Billings in excess of costs and estimated earnings on uncompleted contracts," represents billings in excess of revenues recognized.

(Continued)

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

Contract costs include all direct material and labor costs and those indirect costs related to contract performance, such as indirect labor, supplies, tools, and repairs. Provisions for estimated losses on uncompleted contracts are made in the period in which such losses are determined. Changes in job performance, job conditions, and estimated profitability, including those arising from contract penalty provisions, and final contract settlements may result in revisions to costs and income and are recognized in the period in which the revisions are determined. Profit incentives are included in revenues when their realization is reasonably assured. An amount equal to contract costs attributable to claims is included in revenues when realization is probable and the amount can be reliably estimated.

Accounts Receivable: Accounts receivable are recognized and carried at the original amount earned less a provision for any uncollectible amounts. Accounts receivable arise from the sales of materials; including, aggregates, ready mix concrete and asphalt, in addition to construction contracts with local, state, and federal governments The Company normally does not charge interest on its accounts receivable. The Company performs ongoing credit evaluations of its customers and generally does not require collateral, although the law provides the Company the ability to file mechanics' liens on real property improved for private customers in the event of non-payment by such customers.

The Company maintains allowances for potential credit losses based upon expected collectability of specific customer balances. An allowance for doubtful accounts is made when collection of the full amount is no longer probable. Amounts are considered past due based on billing date and are written off after all reasonable collection efforts have been exhausted. At January 2, 2016, management has recorded an allowance for doubtful accounts of $1,046,119.

Accounts receivable include amounts billed but not paid by customers under retainage provisions in construction contracts totaling $3,293,329.

Long-Lived Assets: Long-lived assets are periodically reviewed for impairment based on an assessment of future operations in accordance with ASC 360, *Property, Plant, and Equipment.* The Company records impairment losses on long-lived assets used in operations when indicators of impairment are present and the undiscounted cash flows estimated to be generated by those assets are less than the assets' carrying amount.

Based on the Company's analysis, there were no impairment losses recognized during the year ended January 2, 2016.

(Continued)

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

Inventories: Inventories are stated at the lower of average cost or market. Inventories consist of both raw materials and finished products. Inventory costs are determined in accordance with *Inventory Costs* (ASC 330), which states that abnormal amounts of idle facility expense, freight, handling costs and wasted materials should be recognized as current-period charges and require the allocation of fixed production overhead to inventory to be based on the normal capacity of the underlying production facilities. Cost components include manufacturing cost, freight, overhead and amounts paid to suppliers of materials and products. Market for raw materials is replacement cost and for finished goods, market is net realizable value.

Inventories at January 2, 2016 consisted of the following:

Crushed stone, sand, gravel and other aggregates	$ 22,533,163
Asphalt, cement, and other materials	2,355,703
Total construction materials inventory	24,888,866
Diesel and other fuels	411,493
	$ 25,300,359

Property, Plant, and Equipment: Property, plant, and equipment acquired in a business combination are stated at fair value; other property, plant, and equipment are stated at cost. Depreciation of property, plant, and equipment is determined on the straight-line method over the estimated useful lives of the assets, which are generally 10-25 years for buildings and improvements, 8-20 years for vehicles and furniture and fixtures, and 5-8 years for equipment and machinery. Depletion of mineral rights is computed by the units-of-production method based on permitted recoverable units. Expenditures for renewals and betterments are capitalized and depreciated over their related estimated useful lives; whereas, expenditures for maintenance and repairs are expensed as incurred.

Depreciation and depletion expense for the year ended January 2, 2016 was $18,979,130.

Goodwill and Intangible Assets: The Company has recorded goodwill and intangible assets in accordance with Accounting Standards Codification (ASC) 805, *Business Combinations* (ASC 805). As of January 2, 2016, the Company had two definite lived intangible assets: (1) a contract based intangible asset ("Contract based intangible A"), which is being amortized utilizing the depletion method over a remaining life of 7 years, and (2) a contract based intangible asset ("Contract based intangible B"), which is being amortized utilizing the straight-line method over 11 years. Amortization expense for the year ended January 2, 2016 for the related intangibles was $648,948.

The following table below summarizes intangible assets owned by the Company as of January 2, 2016:

	Cost	Accumulated Amortization	Net
Contract based intangible A	$ 5,200,000	$ (1,020,904)	$ 4,179,096
Contract based intangible B	260,000	(15,757)	244,243
Total	$ 5,460,000	$ (1,036,661)	$ 4,423,339

(Continued)

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

Future amortization expense associated with the Company's contract based intangible asset is as follows:

2016	$ 644,236
2017	719,136
2018	788,686
2019	811,156
2020	822,926
Thereafter	637,199
	$ 4,423,339

The changes in carrying amount of goodwill for the year ended January 2, 2016, are as follows:

Balance as of December 28, 2014	$ 180,526,532
Goodwill acquired during year (See note 11)	11,515,738
Adjustment to goodwill related to Capitol Aggregates Acquisition - May 2014	4,994
Balance as of January 2, 2016	$ 192,047,264

The Company evaluates goodwill for impairment annually in accordance with ASC 350, *Intangibles - Goodwill*. During the year ended January 2, 2016, the Company performed its annual impairment test of goodwill and did not identify any impairment.

Accounts Payable: Accounts payable include amounts billed but not paid to suppliers and subcontractors under retainage provisions of construction contracts totaling $691,299.

Advertising: Advertising costs are expensed as incurred and are included in selling and administrative expenses on the accompanying consolidated statement of income. Advertising costs for the year ended January 2, 2016 were immaterial.

Income Taxes: Taxable income of the Company is included in the consolidated federal income tax return of Oldcastle, Inc. (Oldcastle) the Company's ultimate U.S. parent. Oldcastle has allocated an income tax charge to its subsidiaries based on its overall consolidated effective tax rate applied to the specific tax attributes of the Company.

Deferred income taxes are provided for all significant temporary differences between income reported for financial reporting and income reported for tax purposes. Deferred income tax assets arise primarily from the recording of accruals, which are not currently deductible for tax purposes. Deferred income tax liabilities arise primarily from the effect of the use, for income tax purposes, of accelerated methods of depreciation and amortization.

The Company applies accounting for uncertain tax positions in accordance with ASC 740, *Income Taxes*. A tax position is recognized as a benefit only if it is "more likely than not" that the tax position would be sustained in a tax examination, with a tax examination being presumed to occur. The amount recognized is the largest amount of tax benefit that is greater than 50% likely of being realized on examination. For tax positions not meeting the "more likely than not" test, no tax benefit is recorded.

(Continued)

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Continued)

The Company does not expect the total amount of unrecognized tax benefits to significantly change in the next twelve months. The Company recognizes interest and penalties related to income tax matters in income tax expense. The Company did not have any amounts accrued for interest and penalties at January 2, 2016.

The Company's income tax returns for the fiscal years 2012 through 2015 remain open to examination by federal tax authorities. The Company's state income tax returns remain open to examination by state tax authorities in Texas and surrounding states for the fiscal years 2011 through 2015.

Since the Company is included in the consolidated federal income tax return of the Company's U.S. parent, all income tax expenses are paid by the U.S. parent.

Fair Value of Financial Instruments: The carrying amounts reported in the accompanying consolidated balance sheet for cash, accounts receivable, and accounts payable approximate fair values because of their short-term nature. The carrying amount of due to parent approximates the fair value due to its interest rate that approximates market rates of interest.

Subsequent Events: Subsequent events have been evaluated through March 21, 2016, which is the date the financial statements were available to be issued.

NOTE 3 - CONTRACTS IN PROGRESS

Amounts relating to uncompleted construction contracts as of January 2, 2016 are as follows:

Costs incurred on uncompleted contracts	$ 282,114,162
Estimated earnings thereon	21,087,558
	303,201,720
Billings to date	300,095,378
	$ 3,106,342

Included in the accompanying consolidated balance sheet under the following captions:

Costs and estimated earnings in excess of billings on uncompleted contracts	$ 11,089,308
Billings in excess of costs and estimated earnings on uncompleted contracts	(7,982,966)
	$ 3,106,342

(Continued)

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 4 - INCOME TAXES

The components of the Company's tax provision for income taxes are as follows:

Federal and state income tax expense (benefit)	
Current	$ 2,590,061
Deferred	10,143,000
Total	$ 12,733,061

Deferred income taxes on the accompanying consolidated balance sheet include deferred tax assets (no valuation allowance considered necessary) and deferred tax liabilities as follows:

Deferred tax assets	
Inventory	$ 1,847,000
Nondeductible reserves and other liabilities	209,000
Bad debt	366,000
Total deferred tax assets	2,422,000
Deferred tax liabilities	
Depreciation	(22,957,000)
Intangibles	(19,821,000)
Total deferred tax liabilities	(42,778,000)
Net deferred tax liabilities	$ (40,356,000)

All deferred tax assets are classified as current and all deferred tax liabilities are classified as long-term on the accompanying consolidated balance sheet.

NOTE 5 - ASSET RETIREMENT OBLIGATIONS

In accordance with ASC 410-20, *Asset Retirement Obligations*, provisions for future legally and contractually required reclamation costs have been established based upon estimated future costs to reclaim the Company's quarries and gravel pits. Under ASC 410-20, the Company recognizes asset retirement obligations in the period in which they are incurred if a reasonable estimate of the fair value can be made. The obligation related to the Company's quarries arises over a number of reporting periods and is directly related to the degree of exhaustion performed at each site. When the liability is initially recorded, the Company capitalizes the cost by increasing the carrying amount of the related long-lived asset. Over time the liability is accreted to its settlement value and the capitalized cost is depreciated over the useful life of the related asset. Upon settlement of the liability, the Company will recognize a gain or loss for any difference between the settlement amount and the liability recorded. The Company's liability is reported as part of other long-term liabilities in the accompanying balance sheet. A summary of the Company's asset retirement obligation for the reclamation activity for the year ended January 2, 2016 is as follows:

Beginning balance	$ 62,735
Additional obligations	24,860
Settlements	-
Ending balance	$ 87,595

(Continued)

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 6 - RETIREMENT SAVINGS PLAN

The Company's employees participate in the defined contribution plans of Oldcastle Materials, Inc. for the benefit of employees meeting certain eligibility requirements. The Company contributes to these plans based upon the dollar amount of each participant's contribution. As of January 2, 2016, an accrual in the amount of $3,129,137 for the Company's contribution to these plans is reflected in trade and other payables in the accompanying consolidated balance sheet. Expenses associated with the Company's contribution to these plans totaled $5,074,787 for 2015.

NOTE 7 - TRANSACTIONS WITH PARENT AND AFFILIATES

The amounts due from parent and due to parent included in the accompanying consolidated balance sheet are $14,111,653 and $328,345,702, respectively, and represent the intercompany activity with Oldcastle.

The Company participates in a centralized cash management system with Oldcastle, Inc., the ultimate U.S. parent, whereby excess cash is invested to maximize the return to the system's participants. As the receivable, due from parent, was established through the management of cash, and is expected to be collected in the next 12 months, the Company has classified the amount as a current asset, which is reflected in the accompanying consolidated balance sheet. The amount due to parent of $328,345,702 at January 2, 2016 is due on demand. It is not the parent's intention to call this amount within the next 12 months; therefore, the Company classified this borrowing as long-term debt in the accompanying consolidated balance sheet. In addition, the parent charges the Company 5.5 percent on its loan to the Company. Payments made to Oldcastle, Inc. related to the due to parent debt balance are recorded as interest expense and principal retirement, while payments related to equity capital are recorded as dividends; interest expense for the year ended January 2, 2016 was $17,936,881, which is reflected in the interest expense in the accompanying consolidated statement of income. The Company received interest income from the parent based on the net due to or from the parent totaling an immaterial amount for the year ended January 2, 2016.

The Company participates in insurance plans covering workers' compensation, automobile, and general liability claims, which are administered by Companies owned by CRH plc. Prepaid expenses at January 2, 2016 include $1,907,483 of prepaid premiums under these insurance plans, which is reflected in current assets in the accompanying consolidated balance sheet. Related insurance expenses of $1,923,654 are included in general and administrative expenses in the accompanying consolidated statement of income.

The Company participates in a centralized health care management system with APAC Holdings, Inc. where health care costs are charged monthly based on a rate determined by the Company's claims history.

Certain services are provided to the Company by the parent for which the parent charged a management fee of $1,694,156, which is included in general and administrative expenses in the accompanying consolidated statement of income.

NOTE 8 - COMMITMENTS AND CONTINGENCIES

The Company, in the ordinary course of business, is involved in litigation, governmental proceedings, and disputes that could result in litigation, the ultimate disposition of which management believes will not have a material adverse effect upon the financial position or results of operations of the Company.

(Continued)

APAC-TEXAS, INC. AND SUBSIDIARIES
(An indirect, wholly owned subsidiary of CRH plc)
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
January 2, 2016

NOTE 9 - LEASES

The Company leases certain properties and construction equipment under non-cancelable operating leases and on a month-to-month basis. Lease expense for these leases was $20,051,979 for the year ended January 2, 2016.

At January 2, 2016, future minimum rental payments under all non-cancelable operating leases with initial or remaining terms of one year or more were as follows:

2016	$ 7,313,110
2017	6,096,291
2018	5,093,070
2019	4,761,050
2020	4,655,189
Thereafter	18,071,438
	$ 45,990,148

NOTE 10 - CONTRACT BACKLOG

Contract backlog represents unearned revenue on awarded contracts that have not been completed. Projects are added to the contract backlog balance at the time a contract is awarded to the Company. As of January 2, 2016, the Company's contract backlog balance was $208,060,101.

NOTE 11 - ACQUISITIONS

On May 11, 2015, the OMTPAC acquired certain assets and liabilities of State Development Corporation for cash consideration of $2,893,869. The goodwill of $1,347,886 arising from the acquisition consists largely of the Company's effort to expand operations in Texas. State Development Corporation is a domestic construction company which is in the business of manufacturing, producing, and selling asphalt products. The source of funds for this acquisition consisted of cash consideration provided by the Company. The acquisition has been accounted for as a business combination under ASC 805. Accordingly, the purchase price was allocated to the assets acquired based on their fair values at the acquisition date. For income tax purposes, the transaction will be treated as an asset acquisition and goodwill is expected to be deductible.

The fair value of property, plant, and equipment acquired was determined by utilizing related market data for the assets acquired.

The Company's determination of the fair value of the assets acquired are reflected in the accompanying consolidated balance sheet as follows:

Inventory	$ 310,983
Property, plant, and equipment	975,000
Contract based intangible asset	260,000
Goodwill	1,347,886
Cash consideration paid	$ 2,893,869

(Continued)

NOTE 11 - ACQUISITIONS (Continued)

On October 23, 2015, the OMTPAC acquired certain assets and liabilities of Martin Marietta Materials Southwest, Inc. for cash consideration of $22,189,605. The goodwill of $10,167,852 arising from the acquisition consists largely of the Company's effort to expand operations in Texas. Martin Marietta Materials Southwest, Inc. is a domestic construction company which is in the business of manufacturing, producing, and selling asphalt products. The source of funds for this acquisition consisted of cash consideration provided by the Company. The acquisition has been accounted for as a business combination under ASC 805. Accordingly, the purchase price was allocated to the assets acquired based on their fair values at the acquisition date. For income tax purposes, the transaction will be treated as an asset acquisition and goodwill is expected to be deductible. As part of the agreement, the Company entered into certain supply agreements whereby a commitment was made to purchase a minimum of 40,000 tons of cement annually beginning on April 1, 2016 at an initial price per the agreement of $101 per ton. Under the terms of the agreement, the price can change over time. A second supply agreement was entered into related to certain leased property as part of the acquisition. The terms of this agreement require the Company to purchase an annual minimum of 450,000 tons of aggregate materials beginning in fiscal year 2016. In the event the Company fails to purchase the annual minimum requirement, the Company shall pay Martin Marietta Southwest, Inc. an amount equal to the shortfall tons multiplied by $5 per ton. The Company intends to continue with the supply agreements through 2016, and does not foresee any shortfalls resulting from the agreement.

The fair value of property, plant, and equipment acquired was determined by utilizing related market data for the assets acquired.

The Company's determination of the fair value of the assets acquired are reflected in the accompanying consolidated balance sheet as follows:

Inventory	$ 1,364,353
Property, plant, and equipment	10,657,400
Goodwill	10,167,852
Cash consideration paid	$ 22,189,605

NOTE 12 - INVESTMENT IN ASPHALT INC., LLC

On January 1, 2015, the Company acquired a 20% interest in Asphalt Inc., LLC, a domestic construction company which is in the business of manufacturing, producing, and selling asphalt products. The Company accounts for this investment utilizing the equity method. In order to retain its 20% interest, the Company made additional investments during the year for a total investment cost of $6,400,000 at January 2, 2016. During the year, total losses related to this investment were $227,791, which is reflected in the loss on investment in the accompanying consolidated statement of income. As of January 2, 2016, the investment balance was $6,172,209 and is included in the other non-current assets in the accompanying consolidated balance sheet.

SUPPLEMENTARY INFORMATION

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Contractor's Consolidated Financial Statement

January 2, 2016

Assets

Current assets			
1. Cash	$ 2,677,107		
2. Receivables from construction contracts, etc.	46,690,981		
3. Costs and estimated earnings in excess of billings and uncompleted contracts	11,089,308		
4. Inventories, net	25,300,359		
5. Prepaid expenses	4,141,992		
6. Deferred tax assets	2,422,000		
7. Due from parent	14,111,653		
Total current assets		$	106,433,400
Property, plant, and equipment, net			
8. Real estate and mineral rights used in construction business	39,790,282		
9. Construction equipment	142,667,953		
Total property, plant, and equipment, net			182,458,235
Other non-current assets			
10. Goodwill	192,047,264		
11. Intangibles, net	4,423,339		
12. Other assets	6,172,209		
Total other non-current assets			202,642,812
Total assets		$	491,534,447

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Contractor's Consolidated Financial Statement (continued)

January 2, 2016

Liabilities and stockholder's equity

Current liabilities		
13. Trade and other payables	$ 50,986,888	
14. Billings in excess of cost and estimated earnings on uncompleted contracts	7,982,966	
Total current liabilities		$ 58,969,854
Long-term liabilities		
15. Deferred tax liabilities	42,778,000	
16. Long-term debt due to parent	328,345,702	
17. Other long-term liabilities	87,595	
Total long-term liabilities		371,211,297
Stockholder's equity		
18. Common stock, no par value; 1,000 shares authorized and 10 shares issued and outstanding (100% owned by APAC Holdings, Inc.)	-	
19. Retained earnings	61,353,296	
Total stockholder's equity		61,353,296
Total liabilities and stockholder's equity		$ 491,534,447

20. Receivables and materials assigned, sold or pledged	None

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets

January 2, 2016

1.	Cash in banks:			
	Bank of America, Dallas, TX		$	2,617,808
	Citizens National Bank, Malakoff, TX			35,272
	UMB Deposit			15,000
	Various under $5,000			617
				2,668,697
	Cash on hand:			
	Petty cash			8,410
			$	2,677,107
2.	Receivables from construction contracts, etc.:			
	Retainage due upon completion of contracts including securities held in lieu of retainage (see detail below)	$ 3,293,329		
	Amounts receivable after deduction of amounts retained (see detail below)	44,443,771	$	47,737,100
	Less allowance for doubtful accounts			(1,046,119)
			$	46,690,981

Detail of Item 2: Receivables from construction contracts, etc.

Customer	Retained	Currently Due
State Highway Departments		
Texas Department of Transportation	$ –	$ 1,973,505
Counties		
Collin County, TX		81,202
Dallas County, TX		62,613
Ellis County, TX		330,987
Freestone County, TX		82,644
Hardin County, TX		169,908
Henderson County, TX		45,281
Jefferson County, TX	94,096	250,413
Orange County, TX	50,687	63,161
Smith County, TX		40,723
Tarrant County, TX		27,132

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

Detail of Item 2: Receivables from construction contracts, etc. (continued)

Counties (continued)		
Travis County , TX	$ 195,773	$ –
Van Zandt County, TX		119,643
Wise County, TX		71,150
Cities & Towns		
Austin , TX		318,590
Combine, TX		39,340
Dallas, TX	148,023	1,144,486
Fort Worth, TX		73,540
Haltom, TX		22,675
Killeen, TX		129,776
Port Arthur, TX		142,608
Round Rock, TX	211,160	
Temple, TX	139,899	2,769
Waco, TX	66,335	
Other Customers		
Aaron Concrete Contractors, LP, Austin, TX		69,019
Advanced Paving Co., Dallas, TX		93,371
Alamo City Constructors, San Antonio, TX		76,717
Alamo Concrete Products, Austin, TX		124,071
Allco, Inc., Beaumont, TX		239,159
Alpha Concrete, Leander, TX		55,915
Alpha Paving Industries, LLC, Round Rock, TX		54,233
Alpha Ready Mix, LLC, Hutto, TX		68,368
Anchor Concrete Inc., Austin, TX		124,905
Ark Contracting Services, Kennedale, TX		131,491
Arroyo Seco Construction, Dale, TX		108,529
Asphalt Inc., LLC, Austin, TX		576,658
Austin Cement Connect, Buda, TX		183,221
Austin Commercial, Austin, TX		259,080

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

Detail of Item 2: Receivables from construction contracts, etc. (continued)

Other Customers (continued)		
Austin Ready Mix, LLC, Del Valle, TX	$ –	$ 66,239
Barton Commercial, LLC, Austin, TX		57,172
Bayou Construction, Cameron, LA		198,669
BCS Concrete Structures, LLC, Austin, TX		187,635
Bechtel Corporation, Cameron, LA		169,450
Bellview Homes Inc., Austin, TX		57,908
Bennett Paving Inc., Leander, TX		146,591
Brad Drake Construction, LLC, Paris, TX		198,357
Browns Construction, Beaumont, TX		84,598
Capform Inc., Carrolton, TX		860,453
Capital Excavation, Austin, TX	99,304	57,070
Capitol Aggregates Inc., San Antonio, TX		54,081
Cash Construction Company, Pflugerville, TX	146,562	873,820
Centex Materials, LLC, Austin, TX		181,518
Central Road & Utilities, Austin, TX	172,566	463,438
Champion Site Prep, LP, Georgetown, TX	243,278	139,551
Chasco Contractors, Round Rock, TX	351,498	1,053,172
Choctaw Contractors Inc., Wichita Falls, TX		80,000
CMM Construction, Beaumont, TX		83,066
COD Pavement Solutions, Dallas, TX	3,532	154,336
Conatser Construction, Fort Worth, TX		106,168
Contractor's Asphalt Inc., Round Rock, TX		77,239
Cornerstone Paving & Construction, Jasper, TX		156,821
Custom Crete, Euless, TX		124,434
Dallas Paving Co., Dallas, TX		53,245
David Lopez Jr Inc., Austin, TX		84,351
David Weekley Homes Houston, Austin, TX		274,250
Denbow Company Inc., Dripping Springs, TX		71,888
DFW Paving, LP, Fort Worth, TX		68,798
Dixon Paving, Belton, TX	37,611	228,861
DNT Construction, LLC, San Antonio, TX	15,460	312,551

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

Detail of Item 2: Receivables from construction contracts, etc. (continued)

Other Customers (continued)		
Double S Paving, Marion, TX	$ –	$ 711,933
Drewery Construction, Nacogdoches, TX		667,787
East Texas Asphalt Co., LTD, Lufkin, TX		130,833
Echo Maintenance Co., LTD, Port Neches, TX		120,492
E-Z Bel Construction, LLC, San Antonio, TX		324,553
Fieldturf USA Inc., Austin, TX	6,700	62,298
Flat Rock Village, LLC, Waco, TX		279,809
General Growth Properties, Chicago, IL		184,691
GK Hall Construction Inc., Georgetown, TX		112,542
Hanson Aggregates, Dallas, TX		82,178
Harrell Enterprises, LP, Pflugerville, TX		381,009
Hayden Concrete Inc., Round Rock, TX		147,872
Hayden Paving, Inc., Houston, TX		320,399
Hellas Construction, Inc., Jasper, TX		124,113
Henderson Aggregates, LLC, Henderson, TX		1,146,776
Ingram Readymix, New Braunsfels, TX		60,591
Invista S.A.R.L, Orange, TX		75,995
J L Stone Construction, Orange, TX	11,873	106,853
J3 Company, LLC, Comfort, TX	21,554	369,473
Jacobs Field Services North America, Baytown, TX		93,194
Jamco Ventures, LLC, Marietta , GA		302,472
JHL Construction, Gatesville, TX		318,561
Jimmy Cummings, Austin, TX		120,878
Jimmy Evans Company, Austin, TX	113,672	388,398
JKB Construction Co., LLC, Liberty Hill, TX	105,975	230,884
JLB Contracting, LP, Fort Worth, TX		83,039
Joe Bland Construction, Austin, TX	251,136	1,625,428
Jordan Foster Construction, Pflugerville, TX	146,098	894,850
JT's Asphalt & Concrete, Dallas, TX		140,567
Kramer Kompany, Farmersville, TX		59,291

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

Detail of Item 2: Receivables from construction contracts, etc. (continued)

Other Customers (continued)		
Landreth Construction, Georgetown, TX	$ –	$ 94,727
Lanxess Corp., Orange, TX		315,555
Lattimore Materials Co., LP, Ontario, Canada		862,582
Lauren Concrete, LP, Pflugerville, TX		380,915
Lhoist North America (Franklin Industrial Minerals), Fort		206,849
Lonestar Paving Co., Austin, TX	736	1,189,621
Longview Asphalt Inc., Longview, TX		66,367
Longview Bridge & Road, Longview, TX		62,896
Marcelos Sand & Loam, Austin, TX		113,807
Martin Marietta Aggregates, San Antonio, TX		212,874
Martin Marietta Materials Inc., San Antonio, TX		296,963
Martin Marietta Materials, Inc., San Antonio, TX		590,597
McCarthy Building Companies, Austin, TX		191,608
McKinney Drilling Co., Buda, TX		56,766
McLean Construction, LTD, Killeen, TX	3,119	231,556
Mission Asphalt, San Antonio, TX		84,039
Motiva Enterprises, LLC, Port Arthur, TX		292,895
NewLife Worship Center, Inc., Tyler, TX		79,333
O Trevino Construction, LLC, Roanoke, TX		204,918
Oldcastle Texas, Grapevine, TX		62,877
Omega Contracting, Inc., Dallas, TX		157,168
Oscar Orduno Inc., Irving, TX		50,398
Overland Services, Inc., Addison, TX		149,577
Pate Jones, Kennedale, TX		82,053
Patin Construction, Taylor, TX	24,535	445,310
Pavecon Limited, Grand Prairie, TX		100,518
Pavecon Public Works, LP, Grand Prairie, TX		305,737
Pavecon, LTD, Houston, TX		199,574
Peachtree Construction, Inc., Fort Worth, TX		472,859
Premcore Refining Group, Inc., Port Arthur, TX		205,038
Premier Paving, LTD, Fort Worth, TX		1,819,444
Pruneda Construction, Elgin, TX		73,119

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

Detail of Item 2: Receivables from construction contracts, etc. (continued)

Other Customers (continued)		
R D Z Paving, LLC, Live Oak, TX	$ -	$ 54,770
RAC Materials, LLC, Tomball, TX		166,272
Ranger Excavating, LP, Austin, TX	35,814	53,560
Ratliff Ready-Mix, Waco, TX		206,563
Reynolds & Kay, Tyler, TX		201,442
Rio Construction Inc., Carrolton, GA		160,873
Rockhard Concrete, Elgin, TX		67,441
Rogers Construction, Georgetown, TX	12,592	137,216
Rogers O'Brien Construction, Dallas, TX	13,889	386,074
Ross Construction Inc., Austin, TX	48,421	301,388
Satterfield & Pontikes Construction Inc., Houston, TX		132,649
Sitterle Homes - Austin, LLC, San Antonio, TX		82,821
Smith Contracting Company Inc., Austin, TX	59,068	187,390
Stucco USA Inc., Austin, TX		62,311
Taylor Morrison, Austin, TX		89,006
Tex Mix Partners, LTD, Leander, TX		133,529
Texas Slab Co, Austin, TX		87,571
Texas Sterling Construction San Antonio, Fort Worth, TX		162,738
Trans Global Solutions Inc., Nederland, TX		480,362
TTG Utilities, Gatesville, TX	19,460	222,324
W & B Development, Killeen, TX		175,591
Walker and Associates, Tyler, TX		84,440
Watco Companies, Inc., Houston, TX		234,968
Welch Excavation & Utility Co., Winona, TX		63,280
Westhill Const., Cleburne, TX		112,314
Whittlesey Landscape, Round Rock, TX		69,416
Wolff Construction, Salado, TX	13,728	331,861
Other customers – less than $50,000	429,175	6,586,689
	$ 3,293,329	$ 44,443,771

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

3.	Costs and estimated earnings in excess of billings on uncompleted contracts	$	11,089,308
	Customer		
	State Highway Departments		
	Texas Department of Transportation	$	8,083,326
	Counties		
	Coryell County, TX		17,760
	Dallas County, TX		49,909
	Kaufman County, TX		259,751
	Travis County, TX		100,702
	Williamson County, TX		168,555
	Cities & Towns		
	Austin, TX		196,843
	Belton, TX		43,942
	Burnet, TX		76,489
	Dallas, TX		137,665
	Temple, TX		144,729
	Waco, TX		151,104
	Other Customers		
	Alpine Contracting, San Antonio, TX		73,296
	Bechtel Corporation, Houston, TX		70,242
	Jimmy Evans Company, Austin, TX		321,979
	Joeris General Contractors, San Antonio, TX		85,000
	Multi Tenant Management & Const Serv., LLC, Cedar Park, TX		142,931
	Motiva Enterprises, LLC, Houston, TX		150,833
	Ross Construction, Inc., Austin, TX		70,010
	Other customers - less than $50,000		744,242
		$	11,089,308

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Assets (continued)

January 2, 2016

4. Inventories, net:

Construction materials:	
Crushed stone, sand, gravel and other aggregates	$ 22,533,163
Asphalt, cement and other materials	2,355,703
Total construction materials inventory	24,888,866
Diesel and other fuels	411,493
	$ 25,300,359

5. Prepaid expenses:

Prepaid insurance	$ 1,907,483
Prepaid tax	1,910,573
Other prepaid expenses	323,936
	$ 4,141,992

6. Deferred tax assets — $ 2,422,000

7. Due from parent — $ 14,111,653

8. Real estate and mineral rights used in construction business:

Cost Center			
Aggregate Properties, Land and Improvements	Buildings and Improvements	Accumulated Depreciation	
$ 39,271,784	$ 4,904,323	$ (4,385,825)	$ 39,790,282

9. Construction equipment:

Plants and accessory equipment	$ 140,728,858
Mobile equipment	51,788,348
Autos and trucks	35,441,293
	227,958,499
Less accumulated depreciation	(85,290,546)
Net book value	$ 142,667,953

10. Goodwill — $ 192,047,264

11. Intangibles, net — $ 4,423,339

12. Other assets — $ 6,172,209

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Liabilities

January 2, 2016

13.	Trade accounts payable:			
	Retainage payable to subcontractors upon completion of contracts	$ 691,299		
	Other trade payables - no individual vendor over 10% of total	31,750,572		
			$	32,441,871
	Accrued taxes and other liabilities:			
	Accrued payroll taxes	$ 234,264		
	Accrued property taxes	3,403,265		
	Accrued sales and use taxes	1,735,748		
	Accrued salaries and wages	2,089,951		
	Accrued benefits	1,720,418		
	Accrued retirement plan - employer match	3,129,137		
	Accrued incentive compensation	4,564,380		
	Provision for contract loss	220,078		
	Other accrued liabilities	1,447,776		
				18,545,017
			$	50,986,888
14.	Billings in excess of costs and estimated earnings on uncompleted contracts		$	7,982,966
15.	Deferred tax liabilities		$	42,778,000
16.	Long-term debt due to parent		$	328,345,702
17.	Other long-term liabilities		$	87,595

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Details Relative to Stockholder's Equity

January 2, 2016

18.	Capital stock: Common stock, no par value; 1,000 shares authorized and 10 shares issued and outstanding (100% owned by APAC Holdings, Inc.)	$ –
19.	Retained earnings	$ 61,353,296

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Contracts in Progress and Work Completed

January 2, 2016

Contract #	Original Contract	Contract Billed to Date	Cost in Excess of Billings	Billings in Excess of Costs	From Inception to Current Year End: Revenue Earned	From Inception to Current Year End: Cost	From Inception to Current Year End: Gross Profit	Current Year Actual: Revenue Earned	Current Year Actual: Cost	Current Year Actual: Gross Profit	Estimated at Completion: Revised Contract	Estimated at Completion: Estimated Cost	Estimated at Completion: Gross Profit
Contracts in Progress													
253077	$ 27,390,861	$ 15,822,018	$ 525,612	$ -	$ 16,347,630	$ 14,947,208	$ 1,400,422	$ 6,809,779	$ 6,184,304	$ 625,475	$ 29,328,693	$ 26,816,246	$ 2,512,447
253075	20,677,586	8,308,882	2,975,568	-	11,285,450	11,068,292	217,158	6,466,058	6,425,322	40,736	21,092,713	20,686,841	405,872
555567	20,378,648	5,720,207	-	(364,664)	5,355,343	5,355,343	-	3,099,162	3,199,628	(100,466)	20,390,717	20,390,717	-
555475	15,932,823	17,773,637	72,207	-	17,845,844	17,636,549	209,295	9,637,160	9,598,801	38,359	17,845,844	17,636,549	209,295
381041	13,558,266	4,734,979	137,664	-	4,872,643	4,533,624	339,019	4,872,643	4,533,624	339,019	13,558,266	12,614,937	943,329
557486	13,427,787	-	50,461	-	50,461	50,454	7	50,461	50,454	7	13,427,787	13,425,960	1,827
555109	11,611,566	6,036,392	3,054	-	6,039,446	6,055,446	(16,000)	2,106,492	2,172,015	(65,523)	12,532,949	12,548,949	(16,000)
253128	8,977,087	-	118,903	-	118,903	105,720	13,183	118,903	105,720	13,183	9,752,087	8,670,873	1,081,214
382299	9,634,025	6,817,379	245,077	-	7,062,456	6,803,940	258,516	7,045,765	6,787,948	257,817	9,679,880	9,325,555	354,325
556884	9,066,352	196,798	438,863	-	635,661	603,687	31,974	635,661	603,687	31,974	9,066,352	8,610,308	456,044
556882	8,350,610	2,285,377	233,168	-	2,518,545	2,518,545	-	2,518,545	2,518,545	-	8,350,610	8,350,610	-
556528	7,996,899	7,682,421	-	(10,582)	7,671,839	7,969,337	(297,498)	6,626,847	6,935,783	(308,936)	7,765,502	8,063,000	(297,498)
253119	7,502,185	445,978	310,441	-	756,419	601,538	154,881	674,560	536,593	137,967	7,742,114	6,156,872	1,585,242
382309	7,335,235	2,552,774	-	(320,391)	2,232,383	2,463,712	(231,329)	2,232,383	2,463,712	(231,329)	7,319,167	7,550,496	(231,329)
253152	7,078,117	436,151	-	(15,656)	420,495	338,664	81,831	420,495	338,664	81,831	7,078,117	5,700,672	1,377,445
382305	6,925,052	4,956,775	-	(1,089,088)	3,867,687	2,944,880	922,807	3,867,687	2,944,880	922,807	7,002,782	5,331,960	1,670,822
382701	5,418,485	6,977,355	-	-	6,977,355	6,945,273	32,082	766,029	584,542	181,487	6,977,355	6,945,273	32,082
382456	5,753,684	6,542,627	-	-	6,542,627	6,495,369	47,258	72,881	50,344	22,537	6,542,627	6,495,369	47,258
557747	6,534,303	-	30,795	-	30,795	29,255	1,540	30,795	29,255	1,540	6,534,303	6,207,588	326,715
554666	6,406,448	6,487,269	-	-	6,487,269	6,695,093	(207,824)	-	-	-	6,487,269	6,695,093	(207,824)
556246	6,126,688	5,686,480	-	(244,404)	5,442,076	5,235,278	206,798	4,190,860	3,984,061	206,799	6,266,606	6,028,475	238,131
557430	5,543,321	-	17,760	-	17,760	16,872	888	17,760	16,872	888	5,543,321	5,266,140	277,181
253153	4,127,377	2,300,266	1,090,589	-	3,390,855	2,616,678	774,177	3,390,855	2,616,678	774,177	5,458,070	4,211,921	1,246,149
556244	4,971,778	5,406,822	-	-	5,406,822	5,087,806	319,016	349,007	153,401	195,606	5,406,822	5,087,806	319,016
556900	5,250,176	4,223,197	-	(216,901)	4,006,296	3,757,906	248,390	3,981,870	3,734,691	247,179	5,250,176	4,924,665	325,511
555284	4,938,247	5,040,220	-	-	5,040,220	4,570,435	469,785	-	1,486	(1,486)	5,040,220	4,570,435	469,785
253124	4,297,855	3,674,233	309,280	-	3,983,513	3,150,164	833,349	3,977,791	3,145,260	832,531	4,703,714	3,719,699	984,015
382300	4,288,102	4,340,759	-	(428,238)	3,912,521	3,579,692	332,829	3,900,786	3,568,543	332,243	4,658,107	4,261,852	396,255
382304	4,550,319	1,526,711	-	(330,424)	1,196,287	1,153,652	42,635	1,196,287	1,153,652	42,635	4,646,043	4,480,462	165,581
555576	3,800,000	3,719,704	-	(61)	3,719,643	3,216,004	503,639	(531,938)	(490,733)	(41,205)	4,473,000	3,867,356	605,644
557412	4,469,649	-	12,693	-	12,693	12,092	601	12,693	12,092	601	4,469,649	4,258,073	211,576
554910	4,327,637	4,429,448	-	-	4,429,448	4,384,289	45,159	150,001	-	150,001	4,429,448	4,384,289	45,159
253146	4,313,473	451,380	-	(120,919)	330,461	290,093	40,368	330,461	290,093	40,368	4,328,986	3,800,177	528,809
557474	4,261,281	302,472	-	(109,658)	192,814	181,848	10,966	192,814	181,848	10,966	4,261,281	4,018,934	242,347
382311	4,255,415	-	3,372	-	3,372	2,941	431	3,372	2,941	431	4,255,415	3,711,739	543,676
555992	3,390,317	4,167,539	-	-	4,167,539	3,714,382	453,157	737,487	677,839	59,648	4,167,539	3,714,382	453,157
556556	3,503,441	3,915,465	-	(568,167)	3,347,298	3,146,002	201,296	2,708,727	2,526,617	182,110	3,915,465	3,680,001	235,464
557004	3,380,323	249,310	-	(99,146)	150,164	150,164	-	150,164	150,164	-	3,380,323	3,380,323	-
555590	3,140,795	3,298,842	-	-	3,298,842	3,185,227	113,615	30,531	56,884	(26,353)	3,298,842	3,185,227	113,615
556159	3,556,404	3,258,512	-	(49,728)	3,208,784	2,952,081	256,703	999,278	853,033	146,245	3,286,836	3,023,889	262,947
556796	3,000,000	2,797,984	30,873	-	2,828,857	2,710,813	118,044	2,828,856	2,710,813	118,043	3,000,000	2,874,815	125,185
Contracts in progress with original contract amount < $3,000,000	226,827,752	137,528,015	4,482,928	(4,014,739)	137,996,204	124,837,814	13,158,390	102,315,977	92,445,258	9,870,719	188,546,824	170,684,231	17,862,593
	$ 536,278,169	$ 300,096,378	$ 11,089,308	$ (7,982,966)	$ 303,201,720	$ 282,114,162	$ 21,087,558	$ 188,985,945	$ 173,855,314	$ 15,130,631	$ 511,261,821	$ 475,358,759	$ 35,903,062

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Contracts in Progress and Work Completed (continued)

January 2, 2016

Contract #	Original Contract	Contract Billed to Date	Cost in Excess of Billings	Billings in Excess of Costs	From Inception to Current Year End: Revenue Earned	From Inception to Current Year End: Cost	From Inception to Current Year End: Gross Profit	Current Year Actual: Revenue Earned	Current Year Actual: Cost	Current Year Actual: Gross Profit	Estimated at Completion: Revised Contract	Estimated at Completion: Estimated Cost	Estimated at Completion: Gross Profit
Completed Contracts													
382455	$ 6,385,018	$ 6,214,114	$ -	$ -	$ 6,214,114	$ 6,357,939	$ (143,825)	$ 2,393	$ 2,339	$ 54	$ 6,214,114	$ 6,357,939	$ (143,825)
382415	9,178,511	6,157,062	-	-	6,157,062	9,496,104	(3,339,042)	-	(4,003)	4,003	6,157,062	9,496,104	(3,339,042)
253071	5,975,047	5,871,527	-	-	5,871,527	4,734,972	1,136,555	17,921	-	17,921	5,871,527	4,734,972	1,136,555
382278	5,279,327	4,762,463	-	-	4,762,463	4,799,884	(37,421)	-	(2,112)	2,112	4,762,463	4,799,884	(37,421)
382287	4,945,962	4,693,895	-	-	4,693,895	4,688,938	4,957	674	5,464	(4,790)	4,693,895	4,688,938	4,957
253069	3,989,094	4,159,277	-	-	4,159,277	3,280,349	878,928	30,864	500	30,364	4,159,277	3,280,349	878,928
555803	3,551,916	3,601,728	-	-	3,601,728	3,075,865	525,863	169,339	2,645	166,694	3,601,728	3,075,865	525,863
256045	3,219,379	3,410,714	-	-	3,410,714	1,930,922	1,479,792	1,637,290	671,724	965,566	3,410,714	1,930,922	1,479,792
Completed contracts with original contract amount < $3,000,000	106,946,832	115,186,735	-	-	115,186,735	114,761,047	425,688	37,134,769	36,993,959	140,809	115,186,735	114,761,047	425,688
Unallocated overhead	-	-	-	-	-	1,967,272	(1,967,272)	-	1,967,272	(1,967,272)	-	1,967,272	(1,967,272)
	$ 149,471,086	$ 154,057,515	$ -	$ -	$ 154,057,515	$ 155,093,292	$ (1,035,777)	$ 38,993,250	$ 39,637,798	$ (644,548)	$ 154,057,515	$ 155,093,292	$ (1,035,777)

APAC-Texas, Inc. and Subsidiaries
(an indirect, wholly owned subsidiary of CRH plc)

Consolidated Schedule of General and Administrative Expenses

Year Ended January 2, 2016

Compensation	$	29,936,367
Property Tax		3,145,650
Administrative Recharge		491,212
Rent/Leases		1,296,475
Supplies		2,196,866
Professional Fees		1,707,492
Audit Fees		425,000
CRH Fee		1,694,156
Insurance Expenses		1,923,654
Communications		873,288
Auto Expense		1,063,270
IT Expenses		1,085,291
Royalties		3,937,226
Meals & Entertainment		1,173,926
Travel		1,078,227
Utilities		512,827
Other		2,685,430
Building Repair and Maintenance		834,474
Dues & Subscriptions		347,507
Advertising		51,133
Discounts Taken		(28,521)
	$	56,430,950

Current Projects and Work History

2017

Date	Job No	Owner	Project Name	Job Description	Estimator	Est No	Contract Amount
	4961	KBR	Jefferson County KBR Pipeline	Patching	AT	6754A	$ 36,598.00
7/5/2017	3203	Newton County CR 4212	Newton County CR 4212	Replace Bridge & Approaches	AT	6861 Final	
6/21/2017	3202	Port of Beaumont	Port of Beaumont South End Paving Project	South End Paving Project	SB	6851	$ 1,115,600.00
6/21/2017	3201	TxDOT	Hardin County FM 421 Safety Treat Fixed Objects	Safety Treat Fixed Objects	AT	6837	$ 1,375,866.73
5/23/2017	3200	City of Nederland	Holmes Road Rehabilitation Project		SB	6840	
5/23/2017	3199	City of West Orange	City of West Orange Street Improvements	Limestone Patching and Sealcoat	JL	6816A	$ 233,724.70
4/27/2017	3198	TXDOT	Orange County FM 2177	Provide Additional Paved Surface	AT	6818	$ 328,092.65
4/27/2017	3197	TXDOT	Orange County SH 73	GR, BA, ACP	AT	6817	$ 5,658,758.03
1/11/2017	3195	TXDOT	Jefferson County US 69	Mill & Inlay/Overlay	AT	6772	$ 2,081,958.21
6/20/2017	1024	Cheniere	CB&I/Cheniere - Rock Placement	Rock Placement	GT	187	$ 180,000.00
6/9/2017	1023	Flint Hills Resources	Flint Hills - Petro Chem Road Level Up	Petro Chem Road Level Up	BF	258671B	$ 72,276.00
6/9/2017	1022	Flint Hills Resources	Flint Hills - PDU Road Repairs	PDU Road Repairs	BF	176	$ 69,174.50
6/9/2017	1021	Flint Hills Resources	Flint Hills - Lunch Tent Repair	Lunch Tent Repair	BF	258671R1	$ 13,680.00
6/9/2017	1020	Flint Hills Resources	Flint Hills - Contractor Compound Repair	Contractor Compound Repair	BF	258671R1	$ 13,924.00
6/9/2017	1019	Flint Hills Resources	Flint Hills - Au Unit Repair	Au Unit Repair	BF	258671R1	$ 12,322.00
6/9/2017	1018	Flint Hills Resources	Flint Hills - Pot Hole Repairs	Pot Hole Repairs	BF	179	$ 16,868.00
6/9/2017	1017	Flint Hills Resources	Flint Hills - Base Washout Repair - Shortcut	Base Washout Repair	BF	178	$ 9,434.00
6/7/2017	1016	ExxonMobil	Zachry - Dust Control	Dust Control	JB	116B	$ 217,800.00
5/24/2017	1014	Motiva	Motive - Slurry Seal for Existing Parking Lot	Slurry Seal for Existing Parking Lot	BF	168	$ 11,250.00
4/27/2017	1013	Valero	Valero - NSRU Areas	Roadway Improvements	CL	100	$ 314,416.00
4/7/2017	1012	Phillips 66	Excel / Phillips 66	Road Repair (Area 1&2) Combo	BF	149REV1	$ 44,549.00
4/7/2017	1011	Enterprise	Enterprise - Vector Contracting Road Repair	Road Repair	BF	145	$ 24,168.00
3/28/2017	1010	Motiva	Motiva Enterprises	Parking Lot Project	BF	137	$ 88,300.00
3/29/2017	1009	Phillips 66	Excel Phillips 66 - Shoulder Paving	Shoulder Paving	RK	141REV1	$ 23,960.00
3/20/2017	1008	ChemTrade	KBR/ChemTrade	Overlay Patch	CL	143	$ 15,175.00
3/17/2017	1007	Cheniere	Recon/Arkel	Phase One Paving	CL	142	$ 266,696.00
2/16/2017	1006	Natgasoline	Jefferson County	Roadway Paving	AT	6792	$ 132,307.50
2/16/2017	1005	Flint Hills Resources	PSC/Flint Hills	Roadway Patch	CL	258706	$ 14,956.00
2/16/2017	1004	ChemTrade	KBR/ChemTrade	Overlay Patch	JB	123	$ 12,868.00
2/13/2017	1003	Phillips 66	PSC-P66 Patching (Asphalt)	Patching (Asphalt)	JB	108	$ 23,704.50
1/31/2017	1002	Jefferson Energy	Kelley Construction	Tank Paving	CL	103	$ 78,683.00
1/20/2017	1001	ExxonMobil	Prime at Exxon	Install Prime	GT	109	$ 4,725.00
1/13/2017	1000	BASF Corporation	Jefferson County	Grading and Paving	CL	8716	$ 124,140.00

2016

DATE	Job No.	Owner	Project Name	Job Description	Estimator	Est No.	Contract Amount
11/21/2016	3192	Motiva	Motiva Road Patching	ASB Roadway Patching	CL	258707	$ 127,520.00
10/21/2016	3191	ExxonMobil	Jacobs/ExxonMobil BPEX Highway 90	Highway 90 and Entrance Improvements	CL	258643G	$ 1,648,165.00
9/12/2016	3190	TXDOT	Jefferson County US 69	Ramp Reversal	SB	6683	$ 7,251,294.50
8/31/2016	3189	Flint Hills	Flint Hills Road & Parking Work 2016	Additive Rd., S. Olefins Rd., & FOB Parking Overlay	CL	258671D	$ 225,800.60
8/17/2016	3188	TXDOT	Newton County Bridge Replacement FM 2626	Bridge Replacement	TC	6714	$ 3,034,479.00
8/10/2016	3187	TXDOT	Jefferson County IH-10 Interchange	Asphalt Paving (Williams Bros) SMA Overlay	SB	6674	$ 436,090.00
7/21/2016	3186	TXDOT	Newton County SH 87, Cypress Creek to SH 12	1.5" SMA Overlay, Pavement Markings, Rumble Strips and Shoulder	DB	6670	$ 2,174,628.10
7/14/2016	3185	Total Petrochemicals & Refining USA	Total/Roadway-Parking Areas	6 roadways-grading/base installation/2" milling/2" HMAC overlay	CL	258664A	$ 179,887.00
6/28/2016	3184	ExxonMobil	Jacobs/ExxonMobil Baytown Road Repairs	Multiple roads/interseection repairs and paving	CL	258615A	$ 646,500.00
5/23/2016	3183	Valero	Gate 19 Reha	6" Mill - 3" ASB & 3" type C	JB	258579A	$ 190,587.00
5/11/2016	3182	TXDOT	Hardin Co FM 418	Widen Safety Treat Fixed Objects	AT	6668	$ 1,281,590.79
4/28/2016	3181	Motiva	Motiva Tanks 1679 & 1254	Excavate and Pave Tanks	JB	258644JOB	$ 144,601.00
4/19/2016	3178	TXDOT	Jasper US190 Flexible Pavement Repair	Flexible Pavement Structure Repair	TC	6659A	$ 1,078,969.40
4/18/2016	3180	TXDOT	Orange Co. SH0012 Emulsion Trt & Overlay	Emulsion Treat Roadway and Overlay	SB	6663A	$ 441,682.15
4/14/2016	3179	Cheniere	Bechtel - Train 2 & Roadwork	4" Asphalt - Train 2 & Roadwork	JB	258602A	$ 2,165,031.00
4/12/2016	3177	City of Vidor	City of Vidor Woodland Road Rehab	Rework Base and surface Placement	TC	6664A	$ 199,921.00
3/24/2016	3176	TXDOT	Jefferson County US 90 Full Depth Repair	Full Depth Repair	SB	6885A	$ 13,826.00
3/22/2016	3175	Jacobs/Exxon Mobil- Mont Belvieu	Ave E. & Parking area overlay	4" Overlay	JB	258637	
2/29/2016	3174	Flint Hills	North Olefins Road	Rehabilitation	JB	258591A	$ 118,325.00
2/25/2016	3173	City of Groves	Lyndale Additon Asphalt Road Repair	Road Rehabilitation	TC	6647A	$ 229,089.00
2/19/2016	3172	TXDOT	Jefferson Co. SH 87	Mill & Overlay	AT	6636	$ 3,158,875.97
2/16/2016	3171	TXDOT	Jefferson Co US 90	Plane & Overlay	TC	6639	$ 1,284,680.00
2/11/2016	3170	TXDOT	Jefferson Co FM 365	Flexible Pavement Structure Repair	TC	6638	$ 741,215.00
1/19/2016	3168	TXDOT	Orange Co. FM 105	Add Shoulders	AT	6626	$ 2,668,330.65
1/19/2016	3169	TXDOT	Tyler Co. US0069	Mill & Inlay	AT	6627	$ 527,091.00

2015

DATE	Job No.	Owner	Project Name	Job Description	Estimator	Est No.	Contract Amount
12/2/2015	3167	Lanxess	Parking Lot Repairs	Overlay & Base Repair and Overlay	JB	258592	$ 316,155.00
11/3/2015	3166	Motiva	Reservoir Levee Road	Remove & Replace Concrete	JB	258564D	$ 214,307.50
10/15/2015	3165	Valero	6th St. & Ave. F	Excavate, Place Base & Concrete	JB	258585	$ 112,603.00
9/16/2015	3163	TXDOT	Jasper Co. FM1007	Provide Additional Width and Centerline Texturing	DB	6571	$ 1,655,300.24
9/16/2015	3164	Sabine Pass LNG/Cheniere	Bayou/Cheniere Spray Application	Apply MC-30 To Various Areas	SB	250016C	$ 259,873.00
9/8/2015	3162	Sabine Pass LNG/Cheniere	Sabine Pass LNG Asphalt & Sealer	4" Overlay (6351sy) & MC-70 Sealer (32,2502sf)	JB	258570	$ 236,831.75
9/2/2015	3161	TXDOT	Chambers Co. FM 3180	GR, BS, STR, PVMT	SB	6573	$ 783,181.36
9/1/2015	3160	TXDOT	Newton Co. FM 2460	Safety Treat Fixed Objects	SB	6578	$ 1,301,346.31
8/21/2015	3159	TXDOT	Jefferson Co. FM 365 #2 Green Pond Gully	Replace Bridge & Approaches	AT	6575	$ 1,196,548.36
8/21/2015	3158	TXDOT	Jefferson Co. FM 365 #1 Ground Gully	Replace Bridge & Approaches	AT	6574	$ 1,565,852.57
8/20/2015	3157	Invista	Invista BD Storage Access Road	Lime/Flyash Stabilize, Geogrid, Base, 2CST	KE	258537	$ 860,236.89
8/18/2015	3156	TXDOT	Jefferson Co. FM 1406	Replace Bridge & Approaches	AT	6576	$ 994,488.34
7/9/2015	3154	TXDOT	Orange Co. IH0010 Flexible Pavement Repair	Repair Asphalt	AT	6552	$ 786,583.50
7/9/2015	3155	TXDOT	Jefferson Co. SH0073 Overlay Roadway	Overlay Roadway	AT	6549	$ 840,414.09
7/1/2015	3153	TXDOT	Jasper Co. US 96	Mill & Overlay	AT		$ 4,127,377.30
6/30/2015	3151	TXDOT	Orange Co. SH0087 Overlay Roadway	Overlay Roadway	AT	6535	$ 617,135.32
6/30/2015	3152	TXDOT	Jasper Co. US 190 GR, BS, PVMT, & STR	Remove & Replace Bridge	AT	6536	$ 7,078,117.16
6/23/2015	3150	Flint Hills Resources	Flint Hills Laydown Yard	Place 8" Limestone Base & Geogrid	SB	258520A	$ 167,180.00
6/11/2015	3149	City of Vidor	City of Vidor Old Hwy 90 Rehab	Mill, OCST, 2" HMA	AT	6531	$ 197,699.19
6/5/2015	3148	Jacobs	ExxonMobil BOP 17th Street, Avenue H & H&P	Roadway Rehabilitation	SB	258526A	$ 151,661.00
5/20/2015	3147	TXDOT	Jasper Co. US 190 Flexible Pavement Structure Repair	Flexible Pavement Structure Repair	SB	6520	$ 281,360.50
5/19/2015	3146	TXDOT	Jasper Co. US 190 GR, BS, PVMT, STP	Widening & Overlay	DB	6517	$ 4,313,473.26
5/18/2015	3144	Duphil	Duphil Parking Overlay	Overlay	JB	6524A	
4/16/2015	3143	Jefferson County	Road Improvements 2015	Overlay, Rework & Seal Coat	AT	6510	$ 1,027,608.37
3/24/2015	3142	TXDOT	Hardin US 69	Plane & Overlay Various Roads	SB	6481	$ 1,333,591.89
3/18/2015	3141	TXDOT	Jefferson Co. CR	STR, BASE, ACP - Bridge Replacement - Island Park Rd @ Brakes Bayou	SB	6483	$ 2,984,343.00
3/18/2015	3140	TXDOT	Hardin Co. FM 943 GR, BS, PVMT	Pavement Widening/Seal Coat	AT	6475	$ 2,607,577.21
3/18/2015	3139	TXDOT	Orange Co. CS GR, BS, STR, PVMT	Install Turn Lane/Overlay	AT	6474	$ 158,456.78
3/13/2015	3138	Orange Co.	Thomas Road Bridge	Bridge Reconstruction	AT	6478	$ 534,172.40
3/13/2015	3137	City of Orange	Huntsman & Bassett Street Rework	Lime/Flyash Stabilize & Overlay	AT	6466	$ 135,842.00

2014

DATE	Job No.	Owner	Project Name	Job Description	Estimator	Est No.	Contract Amount
12/18/2014	3136	TXDOT	Orange County FM 105	Mill & Overlay	SB	6449	$ 290,384.74
12/18/2014	3135	City of Vidor	Road Rehabilitation	Mill, Base Repair & Overlay	SB	6437	$ 495,262.85
12/18/2014	3134	TXDOT	Jefferson Co. PW 1004	OCST, ACP	AT	6447	$ 55,175.45
12/14/2014	3133	Hanson	Hanson Watco Site	Site Preparation	AT	6440A	$ 855,000.00
12/3/2014	3132	Gerdau	Coil Storage Road	10" Concrete Paving	GT	6277-C	$ 320,000.00
11/26/2014	3131	MeadWestvaco	2014 Entrance Road Rehab	2" Mill & Overlay	SB	6431A	$ 268,544.00
11/18/2014	3130	Jefferson County	US 90 Crossover @ Green Pond Gully	Asphalt Crossover	AT	6443	$ 196,485.50
11/12/2014	3129	TXDOT	Jasper Co. FM 1004	Level-up, ACP Str, Stripe	AT	6427	$ 1,507,560.61
10/27/2014	3128	TXDOT	Orange Co. CR	Railroad Grade Seperation	AT	6416	$ 8,977,087.38
10/22/2014	3127	TXDOT	Newton Co FM 2460	Pavement Widening	AT	6412	$ 1,187,970.52
10/21/2014	3126	Sabine Neches Navigation District	SNND Taylor Bayou Facility Paving Project	Excavation, ASB, Asphalt paving	GT	6425	$ 300,700.00
10/21/2014	3125	ChevronPhillips	Asphalt Paving	ChevronPhillips Chemical/Bomac Asphalt Paving	GT	5862	$ 196,450.00
10/20/2014	3124	TXDOT	Jefferson Co. VA	Install Railroad Tracks	GT	6417	$ 4,297,854.65
10/16/2014	3123	Flint Hills	High Road Rehab	Reconstruction of OSBL High Road Plant Entrance	KE	250002-A	$ 153,701.50
9/28/2014	3122	Amber LP	Amber LP Concrete & Asphalt	Concrete & Base	AT	6328	$ 161,259.50
8/19/2014	3121	TXDOT	Jefferson Co. US 69	Sidewalk Concrete Pavement	GT	6367	$ 383,353.35
8/8/2014	3120	Jefferson Co.	Jack Brooks Taxiway D Reconstruction	Taxiway D Reconstruction	AT	6332	$ 1,906,118.00
8/7/2014	3119	TXDOT	Hardin Co. US69 GR, BS, ACP, STR	Widening/SMA	AT	6365	$ 7,502,185.05
8/6/2014	3118	TXDOT	Jefferson Co. FM 366	Full Depth Repair	CC	6334	$ 538,011.70
8/4/2014	3117	Huntsman Port Neches	Huntsman Contractor Access Roadway	Contractor Access Road	SB	6320A	$ 102,976.50
8/22/2014	3116	TXDOT	Orange Co. SH 62	Install Right Turn Lane	SB	6337	$ 140,492.90
7/29/2014	3115	City of Port Arthur	Pleasure Island Marina	Pavement Rehabilitation	CC	6358	$ 405,289.00
7/29/2014	3114	Jefferson Co.	Runway 16/34 Rehabilitation	Jack Brooks Airport Runway 16/34 Rehabilitation	CC	6356	$ 305,518.00
7/29/2014	3113	Jefferson Co.	Runway Safety Area Grading	Jack Brooks Airport Safety Area Grading	GT	6357	$ 119,490.00
7/22/2014	3112	City of Port Arthur	10th Street Improvements	Asphalt, Concrete curb & gutter, underground drainage	AT	6325	$ 686,131.50
7/11/2014	3111	TXDOT	Jefferson Co. SP 136	GR, BS, STR, PVMT	AT	6310	$ 569,227.19
6/10/2014	3110	Gerdau	3rd & Main Gate Revised	Gerdau 3rd & Main Gate Revised	GT	6239A	$ 368,536.00
5/14/2014	3109	Exxon/Mobil	Heavy Haul Road Phase 4	Jacobs/ExxonMobil Heavy Haul Road Phase 4	AT	6291	$ 162,702.00
5/14/2014	3108	ExxonMobil	Parking Repairs (BOB South Lot)	ExxonMobil Parking Repairs (BOB South Lot)	SB	5776	$ 114,431.00
4/15/2014	3107	TXDOT	Orange Co. SH 12 Plane, SMA, Stripe	Orange Co. SH 12 Plane, SMA, Stripe	AT	6263	$ 2,279,714.00
4/7/2014	3106	TXDOT	Newton Co. SH 12 Plane, SMA, Stripe	Newton Co. SH 12 Plane, SMA, Stripe	GT	6262	$ 1,990,411.83
4/1/2014	3105	ExxonMobil	Jacobs Area's 52 & 09	Jacobs Exxon/Mobil Area's 52 & 09	AT	6231	$ 224,105.00
3/26/2014	3104	BASF	Gate 103 Rehab	BASF Gate 103 Rehab	AT	6158B	$ 226,096.00
3/19/2014	3103	TXDOT	Newton Co. FM 1004 ACP STR STP	Newton Co. FM 1004 ACP STR STP	AT	6248	$ 1,507,560.61
3/13/2014	3102	TXDOT	Hardin Co. US 96 Etc. Mill and Overlay	Hardin Co. US 96 Etc. Mill and Overlay	GT	6243	$ 797,816.05
3/3/2014	3101	Exxon/Mobil	Jacobs Admin Parking-lot	Jacobs Exxon/Mobil Admin Parking-lot	AT	6143A	$ 214,637.70

2/24/2014	3100	TXDOT	Newton Co. SH 87 Pvmnt Repair,OCST, ACP	Newton Co. SH 87 Pvmnt Repair,OCST, ACP	AT	6222	$ 2,705,524.33
2/17/2014	3099	TXDOT	Jefferson Co. SP215 FDR, BS, Mill, Ovrly	Jefferson Co. SP215 FDR, BS, Mill, Ovrly	AT	6220A	$ 1,979,708.80
2/14/2014	3098	TXDOT	Jasper Co. FM 252 HMA Overlay	Jasper Co. FM 252 HMA Overlay	GT	6224	$ 661,886.76
2/13/2014	3097	Exxon/Mobil	Jacobs Heavy Haul Road	Jacobs Exxon/Mobil Heavy Haul Road	AT	6103A	$ 494,866.70
2/13/2014	3096	Exxon Mobil	HB Neild Lab Paving	Exxon Mobil/HB Neild Lab Paving	AT	5805	$ 165,300.00
1/13/2014	3095	Praxair	Bomac Ring Road & Drives	Bomac/Praxair Ring Road & Drives	AT	6135	$ 198,028.00
1/8/2014	3094	Huntsman	Main Road Phase 1	Huntsman Main Road Phase 1	JT/SB	6071REVA	$ 1,271,067.50

2013

DATE	Job No.	Owner	Project Name	Job Description	Estimator	Est No.	Contract Amount
12/17/2013	3093	BASF	Truck Loading	BASF Truck Loading	AT	6177	$ 132,007.00
12/13/2013	3092	BASF	Contractor Parking-lot Expansion	BASF Contractor Parking-lot Expansion	AT	6176	$ 183,632.00
12/12/2013	3091	TXDOT	Hayward Baker/Craig Olden Jefferson 69	Hayward Baker-Craig Olden Division - TXDOT Jefferson Co. US 69	SB	6197	$ 156,049.35
12/10/2013	3090	Meadwestvaco	Entrance Road Replacement	Meadwestvaco Entrance Road Replacement	SB	6151	$ 143,750.00
12/10/2013	3089	Strike	Independence Parkway for Strike	Independence Parkway for Strike	GT	6169A	$ 172,524.00
12/6/2013	3088	TXDOT	Orange Co. SH 73 Asphalt Detour	Orange Co. SH 73 Asphalt Detour	GT	6093	$ 159,384.00
11/21/2013	3087	Exxon Mobil	B&P/Zachary Asphalt Repair	Exxon Mobil B&P/Zachary Asphalt Repair	AT	6120	$ 298,907.00
11/5/2013	3086	Jefferson Co.	Jack Brooks Mill Overlay @ Hangers	Jefferson Co. Jack Brooks Mill Overlay @ Hangers	AT	6153	$ 256,011.26
10/31/2013	3085	TXDOT	Liberty Co. FM 1413	TXDOT Liberty Co. FM 1413	SB	6087	$ 2,173,548.34
10/17/2013	3084	Jasper County	GLO IKE 1 Project #7 Road Improvements Package D Road Rehabilitation	Jasper County GLO IKE 1 Project #7 Road Improvements Package D Road Rehabilitation	SB	6101A	$ 350,956.00
9/30/2013	3083	TXDOT	Newton Co. FM 1013 Edge Stabilization	Newton County FM 1013 Edge Stabilization	SB	6084	$ 282,989.70
9/30/2013	3082	Jasper County	Precinct 4: 2013 County Road Improvements Project	Jasper County Precinct 4: 2013 County Road Improvements Project	SB	6099	$ 235,537.50
9/4/2013	3081	TDCJ	Leblanc Unit Perimeter Road	Leblanc Unit Perimeter Road	GT	5997A	$ 146,000.00
8/14/2013	3080	ExxonMobil	for Jacobs Asphalt & Concrete Paving QUEU LANE	ExxonMobil for Jacobs Asphalt & Concrete Paving QUEU LANE	AT	6075	$ 479,993.75
7/28/2013	3079	TXDOT	Jefferson Co. US 69 Replace Bridge & Approaches	TXDOT JEFFERSON Co. US 69 Replace Bridge & Approaches	AT	6059	$ 1,456,176.70
7/28/2013	3078	TXDOT	Jefferson Co. SH 87 Replace Bridge & Approaches	TXDOT JEFFERSON Co. SH 87 Replace Bridge & Approaches	AT	6058	$ 2,798,252.37
7/28/2013	3077	TXDOT	Jefferson Co. US 69 GR, BS, STR, PVMT, SIGN	TXDOT JEFFERSON Co. US 69 GR, BS, STR, PVMT, SIGN	AT	6060	$ 27,390,861.67
7/22/2013	3076	City of Silsbee	Hartmann and 7th Street	Hartmann and 7th Street Silsbee	GT	6073A	$ 122,458.00
6/12/2013	3075	TXDOT	Liberty Co. US 90 GR, BS, STR, PVMT, SIGN	TXDOT Liberty Co. US 90 GR, BS, STR, PVMT, SIGN	AT	6039	$ 20,677,586.00
5/23/2013	3074	Chevron	Cedar Bayou for Strike	Chevron Cedar Bayou for Strike	GT	6024B	$ 493,989.00
5/20/2013	3073	Lamar	Asphalt Parking for Band Revised	Lamar Asphalt Parking for Band Revised	GT	5725A	$ 340,270.79
5/7/2013	3072	Liberty Co	Cedar Estates Street Improvements	Liberty Co Cedar Estates Street Improvements	GT	5971	$ 290,276.60
4/29/2013	3071	TXDOT	Jefferson County SH 73 ACP, Shoulder Texture	TXDOT Jefferson County SH 73 ACP, Shoulder Texture	SB	5988	$ 5,975,104.16
	3070	TXDOT	Sabine Co. CR (Rock Creek & Williams Drive)	Sabine Co. CR (Rock Creek & Williams Drive)	AT	5987	$ 436,423.00
	3069	TXDOT	Orange Co. FM 105	Orange Co. FM 105	AT	5986	$ 3,989,094.00
	3068	TXDOT	Orange Co. FM 1006	Orange Co. FM 1006	SB	5965	$ 732,186.15
	3067	TXDOT	Jefferson Co.US 90 Mill & Overlay	Jefferson Co. US 90 Mill & Overlay	SB	5964	$ 1,347,159.25
	3066	Goodyear	HSE Concrete Work	Goodyear HSE Concrete Work	GT	5994	$ 105,373.00
	3065	TXDOT	Jasper Co. FM 2799 Edge Stabilization	TXDOT Jasper Co. FM 2799 Edge Stabilization	AT	5931	$ 785,636.00
	3064	TXDOT	Jasper FM 254 Edge Stabilization	TXDOT Jasper FM 254 Edge Stabilization	AT	5932	$ 259,576.60
	3063	ISTC	Drive Entrance & Exit	ISTC Drive Entrance & Exit	GT	5892	$ 154,023.00
	3062	TXDOT	Newton Co. FM 1414 Widen Roadway	Newton Co. FM 1414 Widen Roadway	AT	5911	$ 1,351,308.00
	3061	TXDOT	Jefferson Co. IH 10 Flex Base	Jefferson Co. IH 10 Flex Base	AT	5909	$ 641,464.00
	3060	City of Orange	East Orange Street Improvements	City of Orange East Orange Street Improvements	AT	5888	$ 1,141,774.00

Johnathan Murphy
7630 Homer Drive Beaumont, TX 77708
(409) 284-4124
Jonathan.Murphy@apac.com

Professional Profile

Endeavored as an employee for 5 years with APAC with multiple roles and responsibilities in construction.

- Skilled in Microsoft Excel
- Proficient Use of several survey and design programs including AutoCAD and Trimble based software
- Primavera Scheduling software knowledgeable
- Skilled user of Construction survey equipment including robotic/standard total stations, GPS units, and laser based equipment
- Experienced in equipment operation and capabilities
- Adept use of financial software and incorporation into daily operations

Professional Accomplishments

Safety

- NCCER Certified
- OSHA 30 Certified
- First Aid & CPR Certified
- Flagger Certified

Project Management

- OPS Project Management Training
- Oracle Primavera Training
- Heavy Bid Tool Training

Survey

- Trimble Business Center-HCE Training
- Trimble/Cat-Accugrade Proficient
- TDS/COGO & Survey Pro Competent
- AutoCAD Adept

Work History

Project Lead	APAC-Texas, Inc. Beaumont, TX	4/11 to Current
Party Chief Surveyor	APAC-Texas, Inc. Beaumont, TX	4/09 to 4/11
Instrument Person	APAC-Texas, Inc. Beaumont, TX	4/07 to 4/09

Education

General Studies	Lamar University, Beaumont, TX	Currently Pursuing

Johnathan Murphy•(409) 284-4124•Jonathan.Murphy@apac.com

High School Diploma	Spurger High School, Spurger, TX	Graduated Magna Cum Laude

References

References are available upon request.

Michael L Weible
191 CR 797, Buna, Tx. 77612
(409) 994-2265
Mk6263@peoplepc.com

CONSTRUCTION MANAGER/SUPERINTENDENT

EXPERIENCE

25 years in construction supervision, including accurate takeoffs, estimating, budgeting, contracting, purchasing, and invoicing.

Experience in full on-site construction management and land development; effectively schedule, monitor, and inspect all work from start to customer orientation.

Work effectively with architects, engineers, developers, contractors, inspectors, city officials, agents, and customers.

EMPLOYMENT

APAC-TX. INC. , Beaumont, Tx. **6/89-Present**

Grading Superintendent – 1/ 2004 - Present

Responsible for scheduling multiple work crews, subcontractors, materials, and equipment for all division projects.

Participate in research and estimating of potential projects.

Negotiate change orders, material sources, and lease agreements.

Schedule, monitor, and inspect all work from start to customer orientation.

Maintain budgets, process invoices, and control overhead costs.

Project Manager – 6/ 2000 – 1/ 2004

Responsible for scheduling personnel, subcontractors, and materials for specific projects.

Create, maintain, and update progress schedules.

Maintain project budgets, accurately record and report monthly project cost reports, and control project overhead costs.

Maintain customer, public, and media relations.

(Specific Projects as Project Manager)

TxDOT- US96 Evadale Overpass	contract amount $ 17,000,000
TxDOT- FM 105 Reconstruct Vidor	contract amount $ 7,000,000
TxDOT- FM 327 Reconstruct Silsbee	contract amount $ 3,000,000

Project Superintendent – 1995 – 6/ 2000

Coordinate and oversee day to day operations of specific projects.

Responsible for hiring, training, and monitoring project personnel.

Responsible for maintaining activity budgets and schedules.

(Specific Projects as Project Superintendent)

TxDOT- IH 10 College St. Overpass	Contract amount $ 21,000,000
Ato Fina – Pipe rack foundations	Contract amount $ 600,000
Basis Petroleum – Install conc. roads & storm drainage in new facility	Contract amount $ 3,000,000

Grading Foreman – 1992 – 1995

Mainly responsible for labor, equipment, and duties required for any operations involving subgrade prep, stabilization, grading, and base courses also structural, and drainage excavations.

During my time as a grading foreman, I also worked my crew doing any other available types of work including concrete paving, concrete structures, underground utilities, and asphalt paving during periods of unavailable grading type work.

My crew exceeded estimated production on every assigned task, and upheld a perfect safety record during this period.

Hvy. Equipment Operator - 1989 – 1992

Assigned to operate and maintain any hydraulic heavy equipment to perform needs of all highway, bridge, commercial, and industrial construction.

ALLCO Construction, Beaumont, Tx. 1987 - 1989

Hvy. Equipment operator, lead man performing utility and commercial construction.

Rose Construction, Atlanta, Ga. 1985-1987

Foreman performing site development for commercial and industrial projects.

Jim Walters Construction, Buna, Tx. 1982-1985

82- Laborer / 83- equipment operator / 84 thru 85 foreman performing underground utility installation.

EDUCATION

Sam Houston High School – Moss Bluff, La. Grad. 1981

Ashland online University

Competed courses include;
- Legal Compliance
- Financial Responsibility
- Project Management
- Employee Management
- Diversity Understanding
- Market Development

Texas A&M University sponsored training

Completed courses include;
- Competent Excavation Safety
- State and Federal Highway Const. standards
- State and Federal Barricade standards

Southern Technical Institute

- Computer Science

Kenneth Pierce
201 Parkway
Lumberton, TX 77657

PH: 409-866-1444
Fax: 409-866-1032

Work History

2000-present	APAC-Texas, Inc. Production Manager Oversee production at the asphalt plant and all asphalt operations on company projects.	Beaumont, TX
1986 – 2000	APAC-Texas, Inc. Foreman Oversee asphalt crew to complete asphalt/grading projects on city, state, county and privately owned projects.	Beaumont, TX
1981 – 1986	Self Employed Asphalt Contractor Contracted asphalt work for companies and private owners.	Beaumont, TX
1973 – 1981	APAC-Texas, Inc. Operator After graduating high school, worked as equipment operator on various types of asphalt projects.	Beaumont, TX

Education

2002	**Plant Services Seminar** APAC, Inc.	Atlanta, GA
	Traffic Control Texas A&M University	Beaumont, TX
2001	**Train – The Trainer Flagger** Texas A&M University	Houston, TX
	ASTEC Plant System Executive Seminar	Chattanooga, TN
	Supervisor Training APAC, Inc.	Atlanta, GA
1973 – 1974	Lamar University	Beaumont, TX
1969 – 1973	South Park High School	Beaumont, TX

SECTION G
CONTRACT

CONTRACT

THIS AGREEMENT made this _____ day of _____. 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Two-Hundred and Seventy Four (274)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

SECTION H
NOTICE OF AWARD AND NOTICE TO PROCEED

NOTICE OF AWARD

DATED:_____, 2017

TO: .

ADDRESS:

PROJECT OWNER: JEFFERSON COUNTY

FAA AIP GRANT No. 3-48-0018-034-2017

CONTRACT FOR: TAXIWAY D RECONSTRUCTION (2017) TAXIWAY F TO JERRY WARE APRON

CONSTRUCTION OF: JACK BROOKS REGIONAL AIRPORT

****

You are notified that your Bid dated XXX, 2017 for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for Base Bid with Additive Alternate No. X .

The Contract Price of your contract is_____ dollars and no /100 ($XXXXXX).

You must comply with the following conditions precedent within FIFTEEN (15) days of the date of this *Notice of Award* that is by, XXXXX, 2017

1. You must deliver to the **OWNER 4** fully executed counterparts of the Agreement including all the Contract Documents.

2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Advertisement for Bids, General Conditions (Article 2), and Supplementary Conditions.

3. You must deliver to the **OWNER 4** original ***Certificates of Insurance***, naming the Owner ***(Jefferson County)*** and Engineer ***(Garver, LLC.)*** and their respective agents and employees, to be expressly named as additional insured's, in accordance with the General Conditions.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid in default, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within ten (10) days after you comply with the above conditions, OWNER will return to you one (1) fully signed counterpart of the Agreement with the Contract Documents attached.

Sincerely,
GARVER, LLC

Thomas D Dodson, PE
Senior Project Manager

ACCEPTANCE OF AWARD:
CONTRACTOR:

_____
BY:_____
TITLE:_____
DATE:_____

XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 274 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXX, 2017.

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Thomas D Dodson, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

SECTION I
PERFORMANCE AND PAYMENT BONDS
CERTIFICATE OF INSURANCE

PAYMENT BOND

PERFORMANCE BOND

INSERT INSURANCE DOCUMENTS HERE

SECTION J
GENERAL PROVISIONS
(FAA AC 150/5370-10G)

GENERAL PROVISIONS

SECTION 10
DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-1 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-2 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-3 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-4 AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-5 AIR OPERATIONS AREA (AOA). For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-6 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

10-7 ASTM INTERNATIONAL (ASTM). Formerly known as the American Society for Testing and Materials (ASTM).

10-8 AWARD. The Owner's notice to the successful bidder of the acceptance of the submitted bid.

10-9 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 CALENDAR DAY. Every day shown on the calendar.

10-12 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.

10-13 CONTRACT. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

10-14 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-15 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 CONTRACTOR'S LABORATORY. The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

10-18 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-19 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-20 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.

10-21 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-22 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-23 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

10-24 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-25 FORCE ACCOUNT. Force account work is planning, engineering, or construction work done by the Sponsor's employees.

10-26 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections, observations and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-27 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or

cited standard that may be pertinent to such specific reference.

10-28 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as "Engineer's Laboratory" or "quality assurance laboratory."

10-29 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-30 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-31 MATERIALS. Any substance specified for use in the construction of the contract work.

10-32 NOTICE TO PROCEED (NTP). A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-33 OWNER. The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only.

10-34 PASSENGER FACILITY CHARGE (PFC). Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls."

10-35 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 PAYMENT BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-37 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-38 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-39 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-40 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-41 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

10-42 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-43 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-44 SPONSOR. A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-45 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-46 SUBGRADE. The soil that forms the pavement foundation.

10-47 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-49 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-50 TAXIWAY. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

10-51 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-52 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10

SECTION 20
PROPOSAL REQUIREMENTS AND CONDITIONS

20-1 ADVERTISEMENT (NOTICE TO BIDDERS). *(See Page A-2)*

20-2 QUALIFICATION OF BIDDERS. Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year.

Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.
Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

20-3 CONTENTS OF PROPOSAL FORMS. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-4 ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-5 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the

quantities may be increased or decreased as hereinafter provided in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

20-6 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications. **Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.**

20-7 PREPARATION OF PROPOSAL. The bidder shall submit his or her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. If so requested, the bidder shall state the price (written in ink or typed) both in words and numerals for which they propose to do for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign the proposal correctly and in ink. If the proposal is made by an individual, his or her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his or her authority to do so and that the signature is binding upon the firm or corporation.

20-8 RESPONSIVE AND RESPONSIBLE BIDDER. A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-9 IRREGULAR PROPOSALS. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 BID GUARANTEE. Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

20-11 DELIVERY OF PROPOSAL. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 WITHDRAWAL OR REVISION OF PROPOSALS. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by fax or email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 PUBLIC OPENING OF PROPOSALS. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 DISQUALIFICATION OF BIDDERS. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20

SECTION 30
AWARD AND EXECUTION OF CONTRACT

30-1 CONSIDERATION OF PROPOSALS. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-2 AWARD OF CONTRACT. The award of a contract, if it is to be awarded, shall be made within *the amount specified in the advertisement and proposal in* calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

30-3 CANCELLATION OF AWARD. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

30-4 RETURN OF PROPOSAL GUARANTY. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

30-5 REQUIREMENTS OF CONTRACT BONDS. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-6 EXECUTION OF CONTRACT. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section, within calendar days from the date mailed or otherwise delivered to the successful bidder.

30-7 APPROVAL OF CONTRACT. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-8 FAILURE TO EXECUTE CONTRACT. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

END OF SECTION 30

SECTION 40
SCOPE OF WORK

40-1 INTENT OF CONTRACT. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-2 ALTERATION OF WORK AND QUANTITIES. The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

40-3 OMITTED ITEMS. The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item.

Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-4 EXTRA WORK. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work". Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-5 MAINTENANCE OF TRAFFIC. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration.

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire- rescue equipment, or maintenance vehicles at the airport.

c. When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-6 REMOVAL OF EXISTING STRUCTURES. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-7 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, the Contractor may at his or her option either:

a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the Engineer; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-8 FINAL CLEANUP. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property Owner.

END OF SECTION 40

SECTION 50
CONTROL OF WORK

50-1 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

50-2 CONFORMITY WITH PLANS AND SPECIFICATIONS. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-3 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs);

contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the Engineer for an interpretation and decision, and such decision shall be final.

50-4 COOPERATION OF CONTRACTOR. The Contractor will be supplied with three copies each of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the Engineer and his or her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his or her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

50-5 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his or her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join his or her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-6 CONSTRUCTION LAYOUT AND STAKES. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): **electronic CAD format (.dwg or .dgn).** In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not

concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking

b. Rough Grade slope stakes at 100-foot (30-m) stations

c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

d. Roadways – minimum three (3) per station

Base Course blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot (30-m) stations.

b. Between Lifts at 25-foot (7.5-m) stations for the following section locations:

(1) Runways – each paving lane width
(2) Taxiways – each paving lane width
(3) Holding areas – each paving lane width

c. After finish paving operations at 50-foot (15-m) stations:

(1) All paved areas – Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.

e. Fence lines at 100-foot (30-m) stations minimum.

f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach

Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.

g. Drain lines, cut stakes and alignment on 25-foot (7.5-m) stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).

i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet (120 m) per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

50-7 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-8 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors are authorized to notify the Contractor or his or her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for a decision.

50-9 INSPECTION OF THE WORK. All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform

to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection 70-14 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been established by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as established by the Engineer, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.
In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

50-14 PARTIAL ACCEPTANCE. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer may

accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 FINAL ACCEPTANCE. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60
CONTROL OF MATERIALS

60-1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection: **see construction drawings.**

60-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS. Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-3 CERTIFICATION OF COMPLIANCE. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, the Contractor shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-4 PLANT INSPECTION. The Engineer or his or her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-5 ENGINEER'S FIELD OFFICE. The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be

separate from any building used by the Contractor. The Contractor shall furnish photocopy machine, water, sanitary facilities, heat, air conditioning, wireless internet access and electricity The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable to the Engineer to inspect the workmanship and materials used into the work.

60-6 STORAGE OF MATERIALS. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property Owner's permission.
All storage sites on private or airport property shall be restored to their original condition by the Contractor at his or her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-7 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

60-8 OWNER FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-2 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-3 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-4 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated as follows:

Owner	*Person to Contact (Phone Number)*
Jefferson County (Jack Brooks Regional Airport	*Duke Youmans (409) 719-4900*
Federal Aviation Administration	*James Terrel*

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-5 FEDERAL AID PARTICIPATION. For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-6 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

70-7 PUBLIC CONVENIENCE AND SAFETY. The Contractor shall control his or her operations and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches high. Unless otherwise specified, barricades shall be spaced not more than 4 feet apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor's parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-9 USE OF EXPLOSIVES. When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to

complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below:

- Contractor shall reference the Construction Safety and Phasing Plan for phasing/beneficial occupancy requirements.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2 (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his or her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS. As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the

Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are indicated as follows:

- Contractor shall reference section 70-04 of the General Provisions for utility location information.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70- 04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his or her surety.

70-15.1 FAA FACILITIES AND CABLE RUNS. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport manager a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 NO WAIVER OF LEGAL RIGHTS. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 ENVIRONMENTAL PROTECTION. The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the

Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

SECTION 80
EXECUTION AND PROGRESS

80-1 SUBLETTING OF CONTRACT. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least **25** percent of the total contract cost.

Should the Contractor elect to assign his or her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

80-2 NOTICE TO PROCEED. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-3 EXECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-4 LIMITATION OF OPERATIONS. The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

- The contractor shall reference the Construction Safety and Phasing Plans for all phases of the work.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction (see Special Provisions).

80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION. All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

80-5 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition

that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-6 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his or her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-7 DETERMINATION AND EXTENSION OF CONTRACT TIME. The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

b. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal.

Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period, *as detailed in the Special Provisions*. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-8 FAILURE TO COMPLETE ON TIME. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted

sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
See Proposal and Contract		

The maximum construction time allowed for Schedules [N/A] will be the sum of the time allowed for individual schedules but not more than [N/A] days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-9 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his or her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason above, the Engineer shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be

liable and shall pay to the Owner the amount of such excess.

80-10 TERMINATION FOR NATIONAL EMERGENCIES. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his or her responsibilities for the completed work nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS. The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of **400** feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within **250** feet of an active runway at any time.

END OF SECTION 80

SECTION 90
MEASUREMENT AND PAYMENT

90-1 MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions. Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 lb (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-2 SCOPE OF PAYMENT. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-3 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-4 PAYMENT FOR OMITTED ITEMS. As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-5 PAYMENT FOR EXTRA WORK. Extra work, performed in accordance with the subsection 40-04 titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-6 PARTIAL PAYMENTS. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

When at least 95% of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-7 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-8 PAYMENT OF WITHHELD FUNDS. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-9 ACCEPTANCE AND FINAL PAYMENT. When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, and after the Engineer's receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances.

Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 CONSTRUCTION WARRANTY.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or
(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within 7 days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 30 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 PROJECT CLOSEOUT. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual.

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90

SECTION 100
CONTRACTOR QUALITY CONTROL PROGRAM

100-1 GENERAL. When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

a. Adequately provide for the production of acceptable quality materials.

b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.

c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

Paving projects over $250,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner's representative and the FAA prior to or at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

100-2 DESCRIPTION OF PROGRAM.

a. General description. The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. QUALITY CONTROL PROGRAM. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least **10** calendar days before the **associated work begins.** The Contractor's Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

a. Quality control organization

b. Project progress schedule

c. Submittals schedule

d. Inspection requirements

e. Quality control testing plan

f. Documentation of quality control activities

g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

100-3 QUALITY CONTROL ORGANIZATION. The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

a. **Program Administrator.** The Program Administrator shall be a full-time on-site employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).

(5) Highway materials technician certified at Level III by NICET.

(6) Highway construction technician certified at Level III by NICET.

(7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. Quality control technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.

(2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.

(3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

100-4 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

100-5 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 INSPECTION REQUIREMENTS. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-7 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (for example, P-401)

b. Item description (for example, Plant Mix Bituminous Pavements)

c. Test type (for example, gradation, grade, asphalt content)

d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (for example, plant technician)

g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

100-8 DOCUMENTATION. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description
(2) Compliance with approved submittals
(3) Proper storage of materials and equipment
(4) Proper operation of all equipment
(5) Adherence to plans and technical specifications
(6) Review of quality control tests
(7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-9 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action

shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

100-11 NONCOMPLIANCE.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

(1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

END OF SECTION 100

SECTION 105 MOBILIZATION

105-1 DESCRIPTION. This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 POSTED NOTICES. Prior to commencement of construction activities the Contractor must post the following documents In a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-2 BASIS OF MEASUREMENT AND PAYMENT. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

END OF SECTION 105

SECTION 110
METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-1 GENERAL. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality Index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot values within the lot by using the following formula:

$$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$$

Where: X = Sample average of all sublot values within a lot
x_1, x_2 = Individual sublot values
n = Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2) / (n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot values in the set
d_1, d_2 = Deviations of the individual sublot values x_1, x_2,.. from the average value X that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$
n = Number of sublots

f. For single sided specification limits (that is, L only), compute the Lower Quality Index Q_L by use of

the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with QL, using the column appropriate to the total number (n) of measurements. If the value of QL falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (that is, L and U), compute the Quality Indexes QL and QU by use of the following formulas:

$$Q_L = (X - L) / S_n$$

And

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit
P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project
Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

   A-1 = 96.60
   A-2 = 97.55
   A-3 = 99.30
   A-4 = 98.35
   n = 4

2. Calculate average density for the lot.

   $X = (x_1 + x_2 + x_3 + \ldots x_n) / n$
   $X = (96.60 + 97.55 + 99.30 + 98.35) / 4$
   X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)2)) / (4 - 1)]^{1/2}$
$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$
$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

$Q_L = (X - L) / S_n$
$Q_L = (97.95 - 96.30) / 1.15$
$Q_L = 1.4348$

5. Determine PWL by entering Table 1 with QL= 1.44 and n= 4.

PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

A-1 = 5.00
A-2 = 3.74
A-3 = 2.30
A-4 = 3.25

2. Calculate the average air voids for the lot.

$X = (x_1 + x_2 + x_3 \ldots x_n) / n$
$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
$X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$
$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$
$S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

$Q_L = (X - L) / S_n$
$Q_L = (3.57 - 2.00) / 1.12$
$Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and $n = 4$.

PL = 97

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

$Q_U = (U - X) / S_n$
$Q_U = (5.00 - 3.57) / 1.12$
$Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and $n = 4$.

$P_U = 93$

8. Calculate Air Voids PWL

$PWL = (P_L + P_U) - 100$
$PWL = (97 + 93) - 100 = 90$

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project
Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

   A-3 = 99.30
   A-4 = 98.35
   A-2 = 97.55
   A-1 = 96.60

2. Use n=4 and upper 5% significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

   a. For measurements greater than the average:

      If (measurement - average) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier

      For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

      Since 1.174 is less than 1.463, the value is not an outlier.

   b. For measurements less than the average:

      If (average - measurement) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier.

      For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

      Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

Less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420

96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4867	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0286	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566

43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2672	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2736	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8479	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6962	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

END OF SECTION 110

SECTION K
SPECIAL PROVISIONS

SPECIAL PROVISIONS

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SECTION A – FEDERAL AVIATION ADMINISTRATION REQUIREMENTS

A-01 GENERAL CIVIL RIGHTS PROVISIONS

The contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

This provision also obligates the tenant/concessionaire/lessee or its transferee for the period during which Federal assistance is extended to the airport through the Airport Improvement Program, except where Federal assistance is to provide, or is in the form of personal property; real property or interest therein; structures or improvements thereon.

In these cases the provision obligates the party or any transferee for the longer of the following periods:

(a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits; or
(b) the period during which the airport sponsor or any transferee retains ownership or possession of the property.

A-02 CIVIL RIGHTS – TITLE VI ASSURANCES

Title VI Solicitation Notice:
The Owner, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the **Title VI List of Pertinent Nondiscrimination Statutes and Authorities**, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

   a. Withholding payments to the contractor under the contract until the contractor complies; and/or

   b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

A-03 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   A. Timetables

   B. Goals for minority participation for each trade (Vol. 45 Federal Register pg. 65984 10/3/80)

   C. Goals for female participation in each trade (6.9%)

These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor is also subject to the goals for both federally funded and non-federally funded construction regardless of the percentage of federal participation in funding.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities

and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is the Jefferson County, Texas.

A-04 ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A-05 BUY AMERICAN CERTIFICATION

See Section 010470 "Bidder Certifications" for Contractor Buy American Certification.

A-06 DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

Prompt Payment (§26.29)- The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from Owner. The prime contractor agrees further to return retainage payments to each subcontractor within {specify the same number as above} days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

A-07 ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

A-08 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance

to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Federal Fair Labor Standards Act (29 USC 201)	U.S. Department of Labor – Wage and Hour Division

A-09 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder or offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A-10 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Occupational Safety and Health Act of 1970 (20 CFR Part 1910)	U.S. Department of Labor – Occupational Safety and Health Administration

A-11 RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this contract are subject to requirements and regulations issued by the FAA and the Sponsor of the Federal grant under which this contract is executed.

A-12 TRADE RESTRICTION CLAUSE

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

a. Is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;

c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001

A-13 VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference must be given to Vietnam era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns owned and controlled by disabled veterans as defined in Title 49 United States

Code, Section 47112. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

A-14 COPELAND "ANTI-KICKBACK" ACT

The United States Department of Labor Wage and Hours Division oversees the Copeland "Anti-Kickback" Act requirements. All contracts and subcontracts must meet comply with the Occupational Safety and Health Act of 1970.

United States Department of Labor Wage and Hours Division can provide information regarding any specific clauses or assurances pertaining to the Copeland "Anti-Kickback" Act requirements required to be inserted in solicitations, contracts or subcontracts.

A-15 DAVIS-BACON LABOR PROVISIONS

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent

by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2 Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the

contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;
(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or

indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize

apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts.

The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

A-16 TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the Contractor must promote policies and initiatives for employees and other work personnel that decrease crashes by distracted drivers, including policies to ban text messaging while driving. The Contractor must include these policies in each third party subcontract involved on this project.

A-17 EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and

applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the

administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 18.7a through 18.7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract

Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the

company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such a superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (18.7a through 18.7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 18.7a through 18.7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith

effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 18.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A-18 NOTICE OF NONSEGREGATED FACILITIES REQUIREMENT

Notice to Prospective Federally Assisted Construction Contractors:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the

forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

A-19 TERMINATION OF CONTRACT

a. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services must be immediately discounted (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.

b. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price will be made, but no amount will be allowed for anticipated profit on unperformed services.

c. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor is liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.

d. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination will be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price will be made as provided in paragraph 2 of this clause.

e. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

A-20 CERTIFICATE REGARDING DEBARMENT AND SUSPENSION

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

CERTIFICATION REGARDING DEBARMENT AND SUSPENSION (SUCCESSFUL BIDDER REGARDING LOWER TIER PARTICIPANTS)

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov

2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.

3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

A-21 BREACH OF CONTRACT

Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

A-22 CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

2. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued thereunder;

3. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;

4. To include or cause to be included in any construction contract or subcontract which exceeds $100,000 the aforementioned criteria and requirements.

A-23 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2 .Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 above, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 above.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 above.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION B – STATE TERMS AND CONDITIONS

B-01 NOT USED

SECTION C – LOCAL TERMS AND CONDITIONS

C-01 CONTRACTOR'S INSURANCE

Contractor shall obtain insurance of the types and in the amounts described below. The insurance shall be written by insurance companies and on forms acceptable to Owner.

Owner and Garver, LLC shall be included as an insured under the CGL, (using ISO Additional Insured Endorsement CG 20 10 11 85 or a substitute providing equivalent coverage), and under the commercial automobile liability (using ISO Additional Insured Endorsement CA 2048 or a substitute providing equivalent coverage), and commercial umbrella, if any. This insurance, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Commercial General and Umbrella Liability Insurance: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than $5,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to the Project.

CGL insurance shall be written on ISO occurrence form CG 20 10 (11-85) (or a substitute combination of the following forms CG 20 10 (10-01) and CG 20 37 (10-01) providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury and liability assumed under an insured contract.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or amending the contractual coverage in the ISO occurrence form.

CGL insurance shall be written with an ISO form CG 25 03 05 09 Designated Construction Project(s) General Aggregate Limit or a substitute form providing equivalent coverage.

Continuing CGL Coverage: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance, with a limit of not less than $5,000,000 each occurrence for at least 3 years following substantial completion of the Work.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed Work equivalent to that provided under ISO form CG 00 01.

Owner's and Contractor's Protective Liability Insurance: Contractor shall maintain Owner's and Contractor's Protective Liability (OCP) insurance on behalf of Owner and Garver, LLC, as named insured, with a limit of $1,000,000.

Railroad Protective Liability Insurance: Not applicable.

Commercial Auto and Umbrella Liability Insurance: Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than $1,000,000 each accident.

Such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos).

Commercial auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

If the Contract Documents require Contractor to remove and haul hazardous waste from the Project site, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under the ISO Pollution Liability-Broadened Coverage for Covered Autos Endorsement (CA 99 48) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

Workers' Compensation Insurance: Contractor shall maintain workers' compensation and employer's liability insurance.

1 Definitions:

1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Contractor's Insurance requirements above.

4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 1. – 7. with the certificates of coverage to be provided to the person for whom they are providing services.

10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

The employer's liability, and if necessary commercial umbrella, limits shall not be less than $500,000 each accident for bodily injury by accident or $500,000 each employee for bodily injury by disease.

If Contractor leases its employees, the alternate employer endorsement (WC 00 03 01 A) shall be attached showing Owner in the schedule as the alternate employer.

Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy.

Where applicable, Nonappropriated Fund Instrumentalities Act (NFIA) shall be attached to the policy. NFIA extends the coverage of the Longshore and Harbor Workers' Compensation Act to civilian employees working on United States military bases throughout the world who are not paid with funds appropriated by Congress. These employees, working in facilities operated for the comfort, contentment, and improvement of armed forces personnel, are instead compensated with funds generated from earnings of their facility.

Where applicable, Outer Continental Shelf Lands Act Endorsement shall be attached to the policy.

Where applicable, the Maritime Coverage Endorsement shall be attached to the policy.

If project is located in a state where workers compensation is secured via monopolistic state funds, include evidence of the "Stop Gap" endorsement to the general liability policy.

Property Insurance: If applicable, Contractor shall purchase and maintain property insurance for the Work. Such insurance shall be written in an amount at least equal to the initial contract sum as well as subsequent modifications of that sum. The insurance shall apply on a replacement cost basis. If the insurance obtained in compliance with this paragraph is builders risk insurance, coverage shall be written on a completed value form.

The property insurance as required above shall name as insureds the Owner, Contractor, and all subcontractors and sub-subcontractors on the Project.

Primary and Non-contributory: Contractor agrees that the insurance listed above, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Waiver of Subrogation: Contractor waives all rights against the Owner and Garver, LLC and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability, commercial umbrella liability insurance, automobile liability insurance and workers compensation insurance maintained pursuant to paragraph C-01 of this agreement.

No Implied Waiver: Contractor shall furnish certifications matching the coverage requirements. Failure of Owner or Engineer to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner or Engineer to identify a deficiency from evidence that is provided shall not be construed as a waiver of the contractors obligations to furnish and maintain such insurance, or as a waiver to the enforcement of any of the provisions at a later date.

Any waiver of the contractor's obligation to furnish such certificate or maintain such evidence must be by written change order and signed by a Managing Member (Officer) of the Engineer and the Owner.

Cancellation, Non-Renewal, and/or Impairment Notification: The Contractor shall not cause any insurance policy to be cancelled or permit it to lapse and all insurance policies shall include an endorsement to the effect that the insurance policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance until notice has been mailed to the Owner and Engineer, stating the date when such cancellation or reduction shall be effective, which

date shall not be less than (60) days after such notice.

The amount shown in the bid item for the Owner's Protective Insurance shall include that amount of additional premium required for obtaining Owner's and Engineer's Protective Liability insurance for the Owner and Garver, LLC. The Engineer has the right to request justification from the contractor for the full amount of the cost included under the items "Owner's Protective Insurance".

Notice shall be sent via email and regular mail to the following persons and addresses:

Owner:
Alex Rupp
5000 Jerry Ware Drive
Beaumont, TX 77705
ARupp@co.Jefferson.tx.us

Garver:
Thomas Dodson, PE
Garver, LLC
12141 Wickchester
Suite 640
Houston, TX 77079
TDDodson@GarverUSA.com

C-02 UTILITIES

All work in this contract shall be in accordance with the Texas Underground Facilities Damage Prevention Act. The Contractor shall abide by the most current edition of this Act.

Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown.

The Contractor shall be responsible for the protection of all existing utilities or improvements crossed by or adjacent to his construction operations. Where existing utilities or service lines are cut, broken, or damaged, the Contractor shall replace or repair immediately the utilities or service lines with the same type of original material and construction or better, at his own expense.

C-03 LEGAL HOLIDAYS

Holidays that shall be observed are the following: New Year's Day (January 1); Memorial Day (last Monday in May); Independence Day (July 4); Labor Day (1st Monday in September); Thanksgiving Day (4th Thursday in November); and Christmas Day (December 25); no other days will be so considered. If a holiday falls on a Saturday or Sunday, the observed day shall be the Friday preceding the Saturday or the Monday following the Sunday. No construction observation will be furnished on legal holidays or Sundays, except in an emergency. The Contractor shall observe these legal holidays and all Sundays, and no work shall be performed on these days except in an emergency. Calendar day contract time includes delays for all holidays. Refer to Section C-06 for more information.

C-04 CLEAN UP

From time to time, the Contractor shall clean up the site, including any work areas at the airport, in order that the site presents a neat appearance and the progress of the work not be impeded. One such period of clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary plant, equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

C-05 PROJECT MEETINGS AND COORDINATION

A preconstruction conference will be called by the Engineer at a time convenient to the Owner and before the issuance of the "Notice to Proceed". The Engineer and the Contractor and such subcontractors as the Contractor may desire shall attend this meeting with the Owner.

The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this Contract. The Contractor shall attend all such conferences. This in no way relieves the Contractor of his responsibility to fully coordinate his work under this Contract.

C-06 LIQUIDATED DAMAGES FOR DELAY

The number of calendar days allowed for completion of the project is stipulated in the Proposal and in the Contract and shall be known as the Contract Time. The Contractor agrees that time is a critical element for this Contract. Loss will accrue to the Owner due to delayed completion of the work; and the cost to the Owner of the administration of the Contract, including engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The Contractor agrees that for each day of delay beyond the number of calendar days herein agreed upon for the completion of the work herein specified and contracted for, the Owner may withhold, permanently, from the Contractor's total compensation, the sum of **One**

Thousand Dollars (**$1,000.00**) as stipulated damages for each day of such delay. Should the amount otherwise due the Contractor be less than the amount of such ascertained and liquidated damages, the Contractor and his Surety shall be liable to the Owner for such deficiency.

It is understood and agreed by and between the Owner and the Contractor that the time of completion herein set out is a reasonable time. The Contractor shall perform fully, entirely, and in an acceptable manner, the work contracted for within the contract time stated in the Contract. The contract time shall be counted from ten days after the effective date of the "Notice to Proceed", or the date work commences, whichever occurs first; and shall include all Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of any orders of the Engineer for suspension of the prosecution of the work, due to the fault of the Contractor, shall be counted as elapsed contract time, and shall not be considered for an extension of time.

Extensions of time for completion, under the condition of 3(a) next below, will be granted; extensions may be granted under other stated conditions:

1. If the satisfactory execution and completion of the Contract shall require work or material in greater amounts or quantities than those set forth in the Contract, then the Contract time shall be increased in the same proportion as the additional work bears to the original work contracted for.

2. An average or usual number of inclement weather days, when work cannot proceed, is to be anticipated during the construction period and is not to be considered as warranting extension of time. The days included in the contract time for Normal Weather-Related Events and holidays are as follows:

(On A Monthly Basis)

Month	Normal Weather-Related Events
January	5
February	7
March	4
April	4
May	3
June	4
July	8
August	4
September	6
October	5
November	2
December	5

If, however, it appears that the Contractor is delayed by conditions of weather, outside of normal weather-related events detailed in the proceeding table, extensions of time may be granted.

3. Should the work under the Contract be delayed by other causes which could not have been prevented or contemplated by the Contractor, and which are beyond the Contractor's power to prevent or remedy, an extension of time may be granted. Such causes of delay shall include but not necessarily be limited to the following:

   a. Acts of God, acts of the public enemy, acts of the Owner except as provided in these Specifications, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather.

b. Any delays of Subcontractors or suppliers occasioned by any of the causes specified above.

The Engineer or other authorized representative of the Owner shall keep a written record sufficient for determination as to the inclusion of that day in the computation of Contract time. This record shall be available for examination by the Contractor during normal hours of work as soon as feasible after the first of each construction month. In case of disagreement between the representative of the Owner and the Contractor, as to the classification of any day, the matter shall be referred to the Owner whose decision shall be final.

If the Contractor finds it impossible for reasons beyond his control to complete the work within the Contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the Contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may recommend to the Owner that the contract time be extended as conditions justify. If the Owner extends the contract, the extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

The amount of all extensions of time for whatever reason granted shall be determined by the Owner. In general, only actual and not hypothetical days of delay will be considered. The Owner shall have authority to grant additional extensions of time as the Owner may deem justifiable.

C-07 QUALITY ASSURANCE/MATERIALS TESTING

The Owner shall be responsible for quality assurance testing as stated in theses specifications; however, the Contractor shall be responsible for payment of any subsequent tests made necessary by previous unsatisfactory tests. In this event, the Owner's quality assurance representative shall conduct the additional testing and payment for such tests shall be directly deducted from the Contractor's payment. The Contractor shall pay for additional testing at the Owner's contract rate.

C-08 RECORD DOCUMENTS

The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, Shop Drawings and samples at the site, in good order, and annotated to show all changes made during the construction process. In addition, the Contractor shall note any differences between locations of underground existing facilities shown in the plans and the actual location located during construction. These record documents shall be available to the Engineer for examination and shall be delivered to the Engineer upon completion of the work.

C-09 CONTRACTOR/SUBCONTRACTOR/SUPPLIER LEGAL DISPUTES

Any fees, expenses, charges, fines or other costs borne by the Owner as a result of legal disputes or lawsuits between the contractor and his subcontractors, or between the contractor and his suppliers, shall be deducted from monies due or which may thereafter become due the contractor.

C-10 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements embraced in this contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of final acceptance of the work. The Contractor will be responsible for all costs associated with construction observation and oversight for the repair work. The Owner will give notice of defective materials and work with reasonable promptness. In the event repair work is required, the

Contractor shall remedy any defects and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of the acceptance of the repair work.

C-11 CONTRACTOR'S RELEASE AND AFFIDAVIT

At the project's completion, the Contractor shall execute the attached Release and Lien Waiver to release all claims against the Owner arising under and by virtue of his Contract. The date of the Release shall be that agreed to for the final acceptance of the project with the Owner.

C-12 SUBMITTALS

The Contractor shall prepare and submit information required by the individual Specification sections sufficiently in advance of the related work to allow an appropriate review time by the Engineer. The types of submittals are indicated in the individual Specification sections.

During the preconstruction conference, the Contractor shall review his submittal schedule and procedures, including notifying the Engineer whether electronic submittals or paper submittals will be provided for all submittal packages in the project. Mixing of package types will not be allowed. The Contractor shall provide one of the following submittal package types:

1. Submit electronic submittals via email as PDF electronic files directly to the Engineer's designated representative, or post these PDF electronic files directly to the Engineer's FTP site specifically established for this project. Electronic submittals shall be in Adobe Acrobat (*.PDF) format and shall be legible when printed.

2. Submit six (6) paper submittal copies via mail or other courier service to the Engineer's designated representative.

Submittals shall be neat, organized, and easy to interpret. Assemble complete submittal package into a single indexed electronic file or hard cover bound book, incorporating submittal requirements of an individual Specification section, the transmittal form with unique submittal numbering system, and electronic links or tabs enabling navigation to each item. Unless approved otherwise by the Engineer, all submittals for the individual Specification section shall be submitted at one time.

Submittals must come directly from the Prime Contractor; submittals from subcontractors or suppliers will not be reviewed.

Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Faxed submittals or submittals with extremely small or otherwise unreadable print will not be accepted. Submittals not required by the Contract Documents will be returned by the Engineer without action.

The Contractor shall retain complete copies of submittals on project site. Use only final submittals that are marked with approval notation from Engineer's submittal review stamp with comments form.

Resubmittals shall continue the unique, sequential, submittal numbering system. Resubmittals without unique numbering, example resubmittals transmitted as 005A or 005REV, are unacceptable and will be returned un-reviewed.

C-13 STORMWATER POLLUTION PREVENTION PLAN

Refer to Technical Specification P-156.

C-14 TEST BORINGS/SUBSURFACE INFORMATION

A geotechnical investigation and soils report have been completed for the project area and are available upon request. This information can be obtained by contacting the Engineer.

Soil characteristics provided in any soil reports, or as shown on boring logs, are representative only at the location of the sample taken, and neither the Owner, Engineer nor Engineer's consultants will be responsible for variations in the soil characteristics at other locations. Any subsurface information or geotechnical reports made available to Contractor was obtained and intended for the Owner's design and estimating purposes only. Such reports and drawings are not Contract Documents.

The Contractor may not rely upon or make any claim against Owner, Engineer, or Engineer's Consultants with respect to (1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor and safety precautions and programs incident thereto, (2) other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings, or (3) any Contractor interpretation or other conclusion drawn from any data, interpretations, opinions, or information.

If in any case, the recommendations set forth in the Geotechnical Report conflict with the requirements set forth in these Contract Documents, the requirements in the Contract Documents shall take precedent.

C-15 WAGE RATES

The Davis Bacon minimum wage rates for this project are applicable and included in Section L of this contract.

END OF SPECIAL PROVISIONS

RELEASE OF LIEN

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

DATE OF CONTRACT: _____

Upon receipt of the final payment and in consideration of that amount, the undersigned does hereby release the Owner and its agents from any and all claims arising under or by virtue of this Contract or modification thereof occurring from the undersigned's performance in connection with the

_____

_____

project.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

CONTRACTOR'S AFFIDAVIT

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

_____

DATE OF CONTRACT: _____

I hereby certify that all claims for material, labor, and supplies entered into contingent and incident to the construction or used in the course of the performance of the work on _____

_____

have been fully satisfied.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20___.

_____
Notary Public

My Commission Expires:

_____

The Surety Company consents to the release of the retained percentage on this project with the understanding that should any unforeseen contingencies arise having a right of action on the bond that the Surety Company will not waive liability through the consent to the release of the retained percentage.

Dated _____
Surety Company

By _____
Resident Agent, State of Texas

SECTION L
ADDENDA

INSERT ADDENDA HERE

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	1
Issued (Date):	July 25, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Rescheduled Walk-Throughs & Cut-off Date for Responses to Question Submissions

▪ Property Walk-Throughs

Please note that the original walk-through scheduled for Tuesday, July 25, 2017 *has been rescheduled.* Bidders will now have (2) opportunities to walk-through the airport property and view secured areas of the project, as follows:

Thursday, July 27, 2017 – 10:00 am CDT
Thursday, July 27, 2017 – 1:00 pm CDT

Bidders are to meet at the Jack Brooks Regional Airport, Administration Office (Lobby), 5000 Jerry Ware Blvd., Beaumont, Texas 77705.

This will be the bidder's only opportunity to walk-through the property and view secured areas of the project.

▪ Cut-off Date for Responses to Question Submissions

Bidders must submit technical questions via email to Colin Bible, Project Manager with Garver, LLC. at CMBible@GarverUSA.com **by 5:00 pm CDT, Tuesday, August 1, 2017** in order to receive a response.

Addendum No. 1 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by____ Date: _____

Authorized Signature (Bidder) Scott Blanchard

Asst. Secretaary
Title of Person Signing Above

Oldcastle Materials Texas, Inc., dba Gulf Coast an Oldcastle company
Typed Name of Business or Individual

12907 US Hwy 90, Beaumont, TX 77713
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	2
Issued (Date):	August 2, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Updating DBE Goals, Documenting Pre-Bid Meeting, and Updating existing electrical structure final grades.

- **Updating DBE Goals**

Please find attached the updated DBE Participation Forms. This reflects the new DBE Goals to be met.

- **Documenting Pre-Bid Meeting**

Please find attached the Pre-Bid meeting Agenda and the Pre-Bid meeting sign-in sheet.

- **Updating electrical structure final grades**

Please find attached the electrical drawings for the elevation adjustment of the electrical hand hole. This additional work warranted an update in the L-115 technical specification and pay item (L-115-5.3). The new L-115 specification is attached to this addendum along with the bid form featuring the updated pay item. Furthermore, the FAA-C-1391d specification governing the aforementioned adjustment has been added and so is the updated list of technical specifications.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by ____ Date: _____

Authorized Signature (Bidder) Scott Blanchard

Asst. Secretary
Title of Person Signing Above

Oldcastle Materials Texas, Inc., dba
Gulf Coast an Oldcastle company
Typed Name of Business or Individual

12907 US Hwy 90, Beaumont, TX 77713
Address

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: _____ DBE: ☐ Yes ☐ No

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____

Prime Contract Amount: $ _____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____ _____ _____
Printed Name of Contractor Representative Signature of Representative Date

_____ _____ _____
Printed Name of DBE Signature of Representative Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Prime Contractor: _____ DBE: ☐ Yes ☐ No

DBE Status (Gender & Ethnicity): _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Project Title & No.: _____ IFB/RFP No.: _____

Total Contract: $_____ Total DBE Subcontract(s): $_____

Construction DBE Goals: 12.90% DBE:: _____ %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☐ Other: _____

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☐ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required.** I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): _____

Title: _____

Signature: _____

Date: _____

E-mail address: _____

Contact person that will be in charge of invoicing for this project:

Name (print or type): _____

Title: _____

Date: _____

E-mail address: _____

Bidder Shall Return Completed Form with Offer.

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

TEL 972.377.7480

www.GarverUSA.com

Jack Brooks Regional Airport – Taxiway D Reconstruction (2017) Ware Ramp to TW 'F' Pre-Bid Meeting
10:00 a.m. July 25, 2017

1) **Introductions & Roles:**
   a) Alex Rupp, Airport Manager, Jack Brooks Regional Airport (Owner)
   b) Duke Youmans, Operations Manager, Jack Brooks Regional Airport
   c) Megan Landry, Finance Manager, Jack Brooks Regional Airport
   d) Jamey West, Assistant Purchasing Agent, Jefferson County
   e) Colin Bible, PE, Senior Project Manager, Garver

2) **Bidding Procedures**
   a) Bids proposals are due no later than 11:00 am local time on August 8, 2016 at the Jefferson County Purchasing Division, 1149 Pearl Street, 1st Floor, Beaumont, Texas 77701. After the cut-off time, bids will be publicly opened and read. DO NOT DELIVER BID PACKAGES TO THE AIRPORT – THEY WILL BE CONSIDERED NON-RESPONSIVE.
   b) Instructions to Bidders. Requirements are detailed in this section.
      i) Bid package consisting of an entire project manual and 3 copies of the required documents
      ii) Vendor registration with System for Award Management
   c) Awarded Vendor requirement for Submission of Form 1295
   d) Bids may be held up to 90 days for FAA funding schedule.
   e) Bid Proposal. Contract Time:
      i) 279 Calendar Days; this is inclusive of typical weather days and holidays.
      ii) $1,000 per day Liquidated Damages thereafter.
      iii) Section K identifies included typical weather days per month.
   f) Contract Award

Base Bid – Taxiway D Reconstruction (2017)

3) **Federal Provisions**
   a) The DBE goal is **12.90%**.
      i) Questions regarding goals and good faith efforts should be directed to Megan Landry at the airport.

4) **FAA General Provisions**
   a) 7/21/2014 version of the provisions are included in the project manual portion of the bid documents.
   b) Section 110 covers the calculation of "Percent Within Limits" for concrete pavement pay factors.

5) **Plans and Technical Specifications**
   a) Plansheets G-301 to G-305 for phasing plan and requirements. This project will close Runway 12/30 and Runway 16/34 during overnight hours and to non-commercial traffic during a 2-day period at the beginning of construction. Remaining project work will be done with the runway open to all traffic.
   b) Safety Plan Compliance Document SS-101 – this is a document requirement for working on the airfield.
   c) Concrete Pavement P-501 – this specification has been modified to allow side-form construction
   d) Subbase Course P-154 – for foundation beneath the concrete pavement
   e) Lime-Treated Subgrade – for foundation beneath the subbase course. A 6% dosage rate; 16" depth is anticipated to be windrowed in 2 lifts
   f) Refined Coal Tar Emulsion with Additives – Coating the ware ramp.
   g) Airport Lighting Systems SS-310 – for LED taxiway lighting fixtures

6) **Construction Security**
   a) Security background checks and driver training. These are to be provided by the Contractor at his own expense for employees that will be driving on the airfield.
7) **General Discussion / Question and Answer**

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Shawn Thurman	SpawGlass	409-681-4547	Shawn.thurman@spawglass.com
JD Burns	Electrical Specialties Inc.	409-860-5211	jd@esibmt.com
Justin Burns	Electrical Specialties Inc	(409) 860-5211	Justin@ESIBMT.com
Doug Stanton	Kuest Group	972 722 3874	DOUGSTANTON@KUESTGROUP.com
Brenda Baker	Hartmann Building	409-659-8225	bbaker@hbs[illegible].net
Duke Youmans	JBRA	409-719-4950	dyoumans@co.jefferson.tx.us
Megan Landry	JBRA	409-719-4900	MLANDRY@co.Jefferson.TX.US
Clovis Restrepo	Ez Demolitions/Underground	(281)827-3673	cr@ezdemolitions.com
Javier Castro	Ez Demolition Underground	713)560-7215	javier@ezdemolitions.com

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Arlie Tucker	Gulf Coast	409-284-2598	awtucker@apsc.com
Bill Kelley	Martin Marietta	409-658-7791	William.Kelley@martinmarietta.com
Mike Kelley	MK Constructors	409-769-0089	Sales@MKconstructors.com
Brandon Harrison	Alico	409-860-4459	bharrison@alico.com
Blake Heisler	Brystar Contracting Inc	409-842-6208	ron@brystar.com

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
James West	Jefferson Cty. Purchasing	409-835-8693	jwest@co.jefferson.tx.us
Rodney White	Texas Premier Services, LLC	409.782.4151	RLWHITETPS@GMAIL.COM
Matt Myers	Holes Companies	409-658-0113	Matt@holesinc.com
Lee Aitken	Holes Companies	281-898-1761	Lee@Holesinc.com

SYMBOL	ITEM DESCRIPTION
———	NEW EQUIPMENT
- - -	EXISTING EQUIPMENT
×	EXISTING EQUIPMENT TO BE COMPLETELY DEMOLISHED AND REMOVED, AREA TO BE RESTORED
⊙	L-861T TAXIWAY EDGE LIGHT
⊙	L-852T IN-PAVEMENT TAXIWAY EDGE LIGHT
W⊙W	L-862 RUNWAY EDGE LIGHT, COLOR AS INDICATED
W⊙W	L-850C RUNWAY EDGE LIGHT, COLOR AS INDICATED
⊡ ⊡	BASE MOUNTED LIGHT
⊡	L-867B LIGHT BASE JUNCTION BOX
⊡	L-867D LIGHT BASE JUNCTION BOX
⊡	L-867E LIGHT BASE JUNCTION BOX
[1]	L-858 GUIDANCE SIGN, SEE SIGN INDEX
(W)	L-807 WIND CONE WITH SEGMENTED CIRCLE
4#4	ELECTRICAL DUCT, NUMBER AND SIZE OF CONDUITS AS INDICATED
■	DUCT MARKER
H	HANDHOLE
M	MANHOLE
⏚	3/4" x 10' COPPER CLAD STEEL GROUND ROD
——#——	SERIES LIGHTING CIRCUIT WITH COUNTERPOISE, NUMBER OF HASH MARKS INDICATES NUMBER OF CABLES
→→	DRAIN CONDUIT
AFG	ABOVE FINISHED GRADE
AOA	AIRCRAFT OPERATIONS AREA
OFA	OBJECT FREE AREA
OFZ	OBSTACLE FREE ZONE
RSA	RUNWAY SAFETY AREA
TSA	TAXIWAY SAFETY AREA
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
UON	UNLESS OTHERWISE NOTED
DEB	DIRECT EARTH BURIED

CAUTION NOTES:

1. UNDERGROUND UTILITIES EXIST WITHIN AND ADJACENT TO THE LIMITS OF CONSTRUCTION. AN ATTEMPT HAS BEEN MADE TO LOCATE THESE UTILITIES ON THE PLANS, HOWEVER, ALL EXISTING UTILITIES MAY NOT BE SHOWN AND THE ACTUAL LOCATIONS OF THE UTILITIES MAY VARY FROM THE LOCATIONS SHOWN. PRIOR TO BEGINNING ANY TYPE OF EXCAVATION, THE CONTRACTOR SHALL CONTACT THE UTILITIES INVOLVED AND MAKE ARRANGEMENTS FOR THE LOCATION OF THE UTILITIES ON THE GROUND. THE CONTRACTOR SHALL MAINTAIN THE UTILITY LOCATION MARKINGS UNTIL THEY ARE NO LONGER NECESSARY.
2. TEXAS STATE LAW, THE UNDERGROUND FACILITIES DAMAGE PREVENTION ACT, REQUIRES TWO WORKING DAYS ADVANCE NOTIFICATION THROUGH THE TEXAS ONE-CALL SYSTEM CENTER BEFORE EXCAVATING USING MECHANIZED EQUIPMENT OR EXPLOSIVES (EXCEPT IN THE CASE OF AN EMERGENCY). THE ONE-CALL SYSTEM PHONE NUMBER IS 1-800-245-4545. THE CONTRACTOR IS ADVISED THAT THERE IS A SEVERE PENALTY FOR NOT MAKING THIS CALL. NOT ALL UTILITY COMPANIES ARE MEMBERS OF THE TEXAS ONE-CALL SYSTEM. THEREFORE, THE CONTRACTOR IS ADVISED TO CONTACT ALL NON-MEMBER UTILITIES AS WELL AS THE ONE-CALL SYSTEM.

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL STAKE THE AIRFIELD LIGHTING SYSTEMS, PRIOR TO INSTALLATION OF ANY TRENCH, CABLE, OR LIGHTING APPARATUS. THE INTENT IS TO STAKE THE INSTALLATION AT THE LOCATIONS INDICATED, NOTING ANY DEVIATION FROM PLAN DIMENSIONS TO THE ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL OBTAIN THE SERVICES OF AN EXPERIENCED AND LICENSED SURVEYOR TO PERFORM THIS WORK.
2. THE ENGINEER SHALL PROVIDE ELECTRONIC CADD FILES TO THE CONTRACTOR FOR THIS STAKING WORK. THE CONTRACTOR SHALL STAKE THE ITEMS AND HIS SURVEYOR SHALL PROVIDE A CADD FILE SUBMITTAL BACK TO THE ENGINEER, BASED UPON THIS SUBMITTAL, THE ENGINEER SHALL COORDINATE AND PROVIDE DIRECTIONS ON ANY ADJUSTMENTS NECESSARY TO MEET EXISTING FIELD CONDITION REQUIREMENTS AND COMPLY WITH FAA ADVISORY CIRCULAR REQUIREMENTS ON THE LAYOUT AND SPACING OF EQUIPMENT.
3. THE CONTRACTOR AND HIS SURVEYOR SHALL THEN MAKE ANY ELECTRONIC CADD FILE SPACING ADJUSTMENTS AND / OR FIELD STAKING ADJUSTMENTS PRIOR TO INSTALLATION AT NO ADDITIONAL COST TO THE OWNER.
4. THE CONTRACTOR SHALL VERIFY EXACT PAVEMENT EDGE DIMENSIONS WITH THIS INITIAL SURVEY WORK.
5. THE CONTRACTOR SHALL FIELD MARK AND IDENTIFY TAXIWAY POINT OF TANGENCY (PT) AND INTERSECTION POINTS (IP) LOCATIONS WITH EMBEDDED BRASS MARKERS.
6. THE EXISTING AND THE PROPOSED LOCATIONS OF LIGHTING CABLES ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD LOCATING AND IDENTIFYING THE EXISTING LIGHTING CIRCUITS TO DETERMINE THEIR EXACT ROUTING. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR MAINTAINING THE LIGHTING SYSTEMS IN A WORKING CONDITION UNTIL THE NEW LIGHTING CIRCUITS HAVE BEEN INSTALLED AND TESTED. THE CONTRACTOR SHALL PROACTIVELY AND EXPEDITIOUSLY ACCOMPLISH THIS CABLE IDENTIFICATION WORK PRIOR TO PERFORMING ANY MODIFICATIONS TO THE LIGHTING CIRCUITS. COORDINATE IDENTIFICATION WORK WITH THE OWNER AND ENGINEER AND MAKE ALL CORRECTIONS, ADDITIONS, ETC. ON THE AS-BUILT DRAWINGS.
7. THE CONTRACTOR SHALL BE EXTREMELY CAREFUL WHILE EXCAVATING IN THE AREA OF LIGHTING CIRCUITS. ANY CABLE OR CONDUIT / DUCT FOUND IS NICKED OR DAMAGED DURING EXCAVATION SHALL BE PROPERLY AND EXPEDITIOUSLY SPLICED OR THE LENGTH OF CABLE AND CONDUIT / DUCT REPLACED. A SPLICE OR CONDUIT / DUCT MARKER SHALL BE INSTALLED AT ALL SPLICE OR OTHER REPAIR LOCATIONS MORE THAN 2' AWAY FROM A LIGHT, SIGN, HANDHOLE, MANHOLE, OR JUNCTION STRUCTURE. ALL REPAIR AND / OR REPLACEMENT WORK AND MATERIALS SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER AND TO THE SATISFACTION OF THE OWNER AND ENGINEER.
8. ALL ELECTRICAL CABLES SHALL BE CLEARLY IDENTIFIED, LABELED, AND TAGGED AT ALL POINTS WHERE THEY ARE AVAILABLE FOR CONNECTIONS OR INSPECTION, INCLUDING, BUT NOT LIMITED TO MANHOLES, HANDHOLES, PULL BOXES, JUNCTION BOXES, AND LIGHT BASES.
9. THE CONTRACTOR SHALL PERFORM MEGGER TESTS ON EACH EXISTING SERIES CIRCUIT PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM AND EACH NEW AND EXISTING SERIES CIRCUIT AFTER THE ACCEPTANCE TEST PERIOD. MEGGER TESTING REQUIREMENTS SHALL BE SUBSIDIARY TO AND PAID FOR BY L-108 PAY ITEMS.
10. THE CONTRACTOR SHALL COORDINATE WITH THE ON-SITE ENGINEER FOR OWNER AND ENGINEER WITNESS OF ALL MEGGER TESTING. THE CONTRACTOR SHALL SUBMIT HIS INITIAL MEGGER TEST REPORTS TO THE OWNER AND ENGINEER PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM. THIS REPORT SHALL BE APPROVED AND SIGNED BY THE OWNER AND ENGINEER PRIOR TO THE CONTRACTOR PROCEEDING WITH HIS WORK.
11. THE CONTRACTOR SHALL CHECK THE LOAD ON EACH EXISTING REGULATOR PRIOR TO ANY WORK ON THE ELECTRICAL SYSTEM AND ON EACH EXISTING REGULATOR AFTER THE ACCEPTANCE TEST PERIOD.
12. THE CONTRACTOR SHALL CALIBRATE EACH EXISTING REGULATOR FOLLOWING THE PERFORMED WORK.
13. LOCKOUT / TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES SHALL BE PAID FOR BY 33-300 PAY ITEMS UNLESS OTHERWISE NOTED.
14. CONDUITS AND DUCTS UNDER PAVED AREAS SHALL BE CONCRETE ENCASED.
15. CONDUITS AND DUCTS UNDER NON-PAVED AREAS SHALL BE NON-ENCASED, UNLESS OTHERWISE NOTED.
16. DURING CONSTRUCTION, PROTECT ALL EQUIPMENT, DUCTS, CONDUITS, CABLES, ETC. THAT ARE TO REMAIN IN PLACE. WHERE EXISTING ITEMS ARE CUT, BROKEN, OR DAMAGED, THE CONTRACTOR SHALL REPLACE OR REPAIR PROACTIVELY AND EXPEDITIOUSLY THE ITEMS WITH THE SAME TYPE OF ORIGINAL MATERIAL AND CONSTRUCTION OR BETTER AT NO ADDITIONAL COST TO THE OWNER AND TO THE SATISFACTION OF THE OWNER AND ENGINEER.

ELECTRICAL SAFETY NOTES:

1. SERIES CIRCUITS CAN BE DANGEROUS AND / OR FATAL.
2. LOCKOUT / TAGOUT PROCEDURES SHALL BE FOLLOWED.
3. LIGHTING REGULATORS SHALL BE TURNED OFF, LOCKED, AND TAGGED OUT OF SERVICE BEFORE ANY WORK IS DONE ON THE SERIES CIRCUIT.
4. THE ELECTRICAL RESISTANCE AND INSULATION INTEGRITY OF EACH MODIFIED CIRCUIT SHALL BE TESTED BEFORE THE CIRCUIT IS ENERGIZED.

DEMOLITION KEYED NOTES:

1. REMOVE EXISTING STAKE-MOUNTED TAXIWAY EDGE LIGHT. (TYPICAL)
2. REMOVE EXISTING BASE MOUNTED TAXIWAY GUIDANCE SIGN. (TYPICAL)
3. DEMOLISH EXISTING ABANDONED CONCRETE GUIDANCE SIGN BASE.
4. EXISTING GUIDANCE SIGN TO REMAIN. (TYPICAL)
5. ABANDON EXISTING DEB SERIES CIRCUIT IN PLACE. (TYPICAL)
6. EXISTING TAXIWAY EDGE LIGHT TO REMAIN. (TYPICAL)
7. EXISTING RUNWAY EDGE LIGHT TO REMAIN. (TYPICAL)
8. REMOVE AND STORE EXISTING IN-PAVEMENT, ELEVATED TAXIWAY EDGE LIGHT. FILL EXISTING LIGHT BASE WITH CONCRETE.
9. REMOVE EXISTING AIRFIELD CIRCUIT AND ABANDON EXISTING CONDUIT SYSTEM.
10. EXISTING AIRFIELD CIRCUIT TO REMAIN. (TYPICAL)
11. DEMOLISH EXISTING 2' X 2' ELECTRICAL PULL BOX.
12. EXISTING ELECTRICAL DUCT BANK TO REMAIN. (TYPICAL)
13. EXISTING JUNCTION STRUCTURE TO REMAIN.
14. REMOVE EXISTING AIRFIELD CIRCUIT AND DEMOLISH ELECTRICAL DUCT BANK.
15. EXISTING FAA CABLE TO REMAIN. FIELD LOCATE PRIOR TO DEMOLITION AND PROTECT DURING CONSTRUCTION.
16. REMOVE EXISTING PRIMARY WIND CONE AND SEGMENTED CIRCLE. DEMOLISH BASE.
17. EXISTING IN-PAVEMENT RUNWAY EDGE LIGHT TO REMAIN.
18. EXISTING FAA COMMUNICATION DUCT BANK TO REMAIN.
19. DEMOLISH EXISTING ABANDONED WIND CONE BASE.
20. EXISTING WIND CONE CIRCUIT TO REMAIN. (TYPICAL)
21. REMOVE EXISTING AIRFIELD CIRCUIT FROM EXISTING ELECTRICAL DUCT BANK. ELECTRICAL DUCT BANK TO REMAIN.
22. EXISTING CONCRETE ENCASED FAA COMMUNICATION DUCT BANK, PROTECT DURING REMOVAL OF TAXIWAY PAVEMENT.
23. REMOVE EXISTING DUCT MARKER.
24. REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN.
25. EXISTING ABANDONED SIGN BASE TO REMAIN.
26. EXISTING DUCT MARKER TO REMAIN.
27. EXISTING DIRECT EARTH BURIED FAA-OWNED COMMUNICATIONS CABLE TO REMAIN.
28. REMOVE AND EXISTING GUIDANCE SIGNS AND ISOLATION TRANSFORMERS. RECONNECT EXISTING RUNWAY CIRCUIT. ABANDON SIGN FOUNDATION IN PLACE.

INSTALLATION KEYED NOTES:

1. INSTALL NEW L-861T(L) BASE-MOUNTED TAXIWAY EDGE LIGHT. (TYPICAL)
2. INSTALL NEW TRENCH TYPE "A". (TYPICAL)
3. INSTALL NEW TRENCH TYPE "B". (TYPICAL)
4. INSTALL NEW BASE-MOUNTED L-858(L) GUIDANCE SIGN. SEE SHEET E-311 FOR SIGN INDEX.
5. CORE DRILL EXISTING LIGHT BASE FOR CONNECTION OF NEW CIRCUIT TO EXISTING CIRCUIT.
6. INSTALL NEW TRENCH TYPE "C".
7. INSTALL NEW TRENCH TYPE "D". (TYPICAL FOR NEW WINDCONE CIRCUIT)
8. INSTALL NEW 2 FT WATERTIGHT CONDUIT STUB-OUT FOR CONNECTION OF DEB CIRCUIT TO NEW LIGHT BASE.
9. INSTALL NEW SURGE ARRESTOR IN LINE WITH THE SERIES CIRCUIT. INSTALL BRASS IMPAVEMENT" MARKER ON CONCRETE LIGHT BASE ENGRAVED WITH "SA".
10. INSTALL NEW CONCRETE ENCASED L-867D JUNCTION STRUCTURE WITH STUBOUTS INDICATED.
11. NEW TAXIWAY LIGHTS SHALL VARY IN DISTANCE FROM TAXIWAY EDGE, TO MATCH NEW TAXIWAY LIGHT OFFSET TO EXISTING TAXIWAY LIGHT OFFSET.
12. ADJUST EXISTING FAA MANHOLE TO NEW GRADE AND INSTALL NEW MANHOLE COVER.
13. INSTALL NEW CONCRETE ENCASED L-867B JUNCTION STRUCTURE WITH STUBOUTS INDICATED. CONNECT TO EXISTING PRIMARY WIND CONE CONDUIT SYSTEM.
14. INSTALL NEW L-807(L) INTERNALLY LIT PRIMARY WIND CONE AND SEGMENT CIRCLE.
15. INSTALL NEW L-852T(L) FLUSH-MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT IN EXISTING PAVEMENT.
16. CONSTRUCT NEW 2-WAY 2"C CONCRETE ENCASED DUCT BANK.
17. INSTALL NEW FAA-STYLE DUCT MARKERS.
18. CONNECT NEW CONDUIT TO EXISTING BASE MOUNTED GUIDANCE SIGN. INSTALL NEW ISOLATION TRANSFORMER. CONNECTORS, NEW LAMPS, AND NEW SECONDARY EXTENSION CORD.
19. EXISTING FAA-OWNED MANHOLE TO REMAIN.
20. INSTALL NEW 2-WAY 2"C DIRECTIONAL BORE UNDER EXISTING PAVEMENT. EXTEND 15' BEYOND PAVEMENT EDGE.
21. INSTALL NEW TRENCH TYPE "E". (TYPICAL FOR DEB CIRCUIT)
22. INSTALL NEW AIRFIELD CONDUCTORS IN EXISTING CONDUIT.
23. CORE DRILL EXISTING OR NEW STORM DRAIN PIPE AND CONNECT NEW DRAINAGE CONDUIT.
24. CORE DRILL EXISTING OR NEW INLET STRUCTURE AND CONNECT NEW DRAINAGE CONDUIT.
25. INSTALL DRAINABLE AGGREGATE AREA AT INDICATED EDGE LIGHT. SEE DRAIN NOTE ON SHEET E-308, DETAIL 3, NOTE 4.
26. CONSTRUCT NEW 2-WAY 2"C NON-ENCASED DUCT BANK.
27. INSTALL NEW L-861T(L) BASE-MOUNTED TAXIWAY EDGE LIGHT WITHIN EXISTING CONCRETE PAVEMENT.
28. INSTALL NEW TRENCH TYPE "F".
29. LOCATE AND SPLIT DUCT ENCASE FAA COMMUNICATIONS CABLE WITH 3" CONCRETE ENCASED CONDUIT.
30. INSTALL NEW VEHICLE SIGN ASSEMBLY.
31. CONNECT NEW CONDUIT TO EXISTING JUNCTION STRUCTURE.

GARVER

REGISTRATION NO. F-5713

MATTHEW C. LEMAY 112999 LICENSED PROFESSIONAL ENGINEER

DIGITALLY SIGNED 09/05/2017

REV.	DATE	DESCRIPTION	BY
1	09/5/2017	ADDENDUM NO. 2	MCL

JACK BROOKS REGIONAL AIRPORT
JEFFERSON COUNTY, TX

TAXIWAY D RECONSTRUCTION (2017)

ELECTRICAL LEGEND AND NOTES

JOB NO.: 17121501
DATE: JULY, 2017
DESIGNED BY: MCL
DRAWN BY: JCS

DRAWING NUMBER
E-001

SHEET NUMBER 50

1206

REGISTRATION NO. P-0710		DIGITALLY SIGNED 08/03/2017					

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel.* The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 MANHOLE ELEVATION ADJUSTMENTS. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall ~~reinstall the manhole top section or ring and cover on top~~ *install a new manhole frame and lid as shown on the plans* and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding

- All Required Connections
- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	Adjust Manhole to New Grade – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

JACK BROOKS REGIONAL AIRPORT
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BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-120-1	SITE PREPARATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$	$
	Unit price in words: _____ dollars and _____ /100				

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				

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JACK BROOKS REGIONAL AIRPORT
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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$	$
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$	$
	Unit price in words: _____ dollars and _____ /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-2	LIME	TON	600	$	$

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TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$	$
	Unit price in words: _____ dollars and _____ /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$	$
	Unit price in words: _____ dollars and _____ /100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$	$

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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$	$
	Unit price in words: _____ dollars and _____ /100				
T-904-1	SODDING	S.Y.	1,405	$	$
	Unit price in words: _____ dollars and _____ /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$	$
	Unit price in words: _____ dollars and _____ /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$	$
	Unit price in words: _____ dollars and _____ /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$	$

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: _____ dollars and _____ /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
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BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700		

FAA-C-1391d

FAA-C-1391d
September 2014
SUPERSEDING
FAA-C-1391c
May 2012

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION SPECIFICATION

INSTALLATION, TERMINATION, SPLICING, AND TRANSIENT/SURGE PROTECTION OF UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM POWER CABLES

This specification is approved for use by all Departments of the Federal Aviation Administration (FAA)

FOREWORD

1. This specification provides requirements for the installation of FAA-owned and maintained underground electrical line distribution (ELD) systems in support of FAA facilities. The ELD systems include power cable and associated components on the exterior, commercial power supply side of the circuit at the airfield or remote site through to the service entrance power panels of FAA facilities.

2. This specification applies only to FAA medium-voltage (MV) and low-voltage (LV) underground power cables, and to a limited extent to overhead lines that may form a part of an FAA-owned circuit. It does not apply to control, telecommunication, or facility service entrance (load side) wiring. For standards pertaining to these non-power cable and electrical systems, consult the appropriate office of primary responsibility for applicable standards.

3. Power for airfield lighting cables has a separate set of standards and procedures. Refer to the appropriate FAA Advisory Circular (AC) 150/5340 and associated governing standards.

4. This is an update to an existing specification. It assimilates recent utility industry knowledge concerning ELD systems, with the aim of providing safer, more reliable FAA underground MV and LV ELD systems.

5. Changes in this version of the document include (see change history, page iv):

   a. Revised from "c" version to "d" version.
   b. Miscellaneous updates collected from field comments.
   c. Submittals section updated; submittals matrix added as an appendix.
   d. Duct joining processes added, with special consideration of joining HDPE sections (see also appendix for sample bonding adhesives data sheet).
   e. Product section updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings, etc).

6. This specification is intended to ensure that minimum FAA requirements are met based on current commercial practices relating to safety, reliability, and restorability of FAA electrical line distribution systems. Contractors are encouraged to provide innovative, best-value solutions wherever possible within the bounds of these requirements.

Comments, suggestions, or questions on this document should be addressed to: Federal Aviation Administration, AJW-22, Power Services Group, Power Cable Program, 800 Independence Ave., S.W., Washington, DC 20591, https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/atc_facilities/power_services/power_cable/

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				

TOTAL (BASE BID) $_____

Total price in words: _____ dollars and _____ /100

Approved by:

Mark Michaud
Manager (A),
Power Services Group, AJW-22

11/5/14
Date

Russell Green,
Manager,
Power Systems Engineering Team,
AJW-221

11/25/14
Date

Michael Vellucci,
Power Cable Program Manager,
Power Systems Engineering Team,
AJW-221

10/30/14
Date

Change History

1. Originator Name and Address AJW-22, Power Services Group	2. [] Proposed	3. Code Identification	4. Document No. FAA-C-1391c
Washington, DC	[X] Approved	5. Code Identification	6. DCN No.
7. System Designation	8. Related ECR/NCP No. ATO0W-CABLE-1023	9. Contract No.	10. Contractual Activity N/A
11. Product Integration Plan		12. Effectivity	

This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with non-listed pages of the original issue of the revision shown in block 4, constitute the current version of this specification.

13. DCN No.	14. Pages changed	S*	A/D*	15. Date
	Summary - general: a. Deletion of requirements for non-electrical-line-distribution (non-ELD) systems, including communications and telecommunications cables (both copper and FOTS), control cables, and constant-current-regulated runway approach and edge lighting power cables. Basic separation requirements between ELD and non-ELD cables have been retained. Installation standards and specifications for the non ELD systems may be found by consulting the appropriate office of primary responsibility. b. Emphasis on product changes in FAA ELD systems from the older 2.4 kV to 4.16 kV distribution circuits to the newer industry standard medium voltage systems, e.g., 3-phase/7200 V (phase to neutral). The Power Cable Program favors 15 kV rated cables and equipment to bring FAA ELD systems up to compatibility with the utility industry and to meet future FAA needs. c. Increased attention to the protection of sensitive internal constituent parts of MV cable systems during installation, by (1) the imposition of stringent tests meeting IEEE criteria, and (2) using proper cable pulling, splicing, and terminating techniques. d. Addition of power cable acceptance testing process for newly installed cables (text main body and Appendix C). Acceptance tests classified as destructive by the IEEE, such as the DC high potential (HIPOT) test, shall no longer be performed on in-service power cables. e. Treatment of the qualifications of MV "qualified persons" during installations.			1/24/2012
	Details – changes: a. Non ELD systems, deletions from FAA-C-1391b version: pp. 1-4, 7-15, 17-19. Sections/paragraphs affected: 2.1.2, 2.1.3, 3.1.2, 3.2.1, 3.2.2, 3.4, 3.4.1.1, 3.4.1.2, 3.4.2.2, Table I, 3.4.3, 3.4.3.1, 3.4.4, 3.4.5, 3.5.1, 3.5.2, 3.6, 4.2, 4.3, 4.5, 4.5.1, 4.5.2, 4.6, 4.6.1, 4.6.2, 4.6.3, App A.			1/24/2012
	Details – changes: b. Product changes, additions in FAA-C-1391c: cable 3.3.6.2; 15 kV surge protection 5.8.2; 15 kV splice kits 5.9.			1/24/2012
	Details – changes: c. Installation of cables, additions in FAA-C-1391c: splice procedures 5.9; cable pulling 5.5.12 and App B; cable end sealing 5.5.11; installer qualifications 3.3.3.2; 50/60 Hz offline partial discharge test 3.3.6.3, 3.3.6.4.			1/24/2012
	Details – changes: d. Acceptance testing procedures, additions in FAA-C-1391c: 3.3.6; Appendix C.			1/24/2012
	Details – changes: e. Qualified persons and contractors, change in FAA-C-1391c: 3.3.3 (all), 3.3.6.4, 5.9.			1/24/2012
	Updated document from "c" version to "d" version.			4/4/2014
	Miscellaneous updates collected from field comments.			4/4/2014
	Submittals updated, products updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings).			4/4/2014
	Manhole cover wheel loading and guard wire grounding upgraded.			8/15/14

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1. SCOPE

This specification defines the minimum requirements for the installation of medium voltage and low voltage (600 V) electrical line distribution (ELD) power cables buried directly in the earth or installed in underground duct or conduit. The industry definition of medium voltage is between 600 V and 34,500 V nominal voltage line to ground. The work includes surveying, trenching, and backfilling, installation of cables, conduits, concrete-encased ducts, hand holes, manholes, duct markers, joints and splicing, terminating, providing surge protection, and testing of cables for acceptability of the finished ELD. In addition, this specification defines the responsibilities of the contractor with respect to safety, quality assurance, and quality control during the installation and testing of ELD systems.

This specification covers installation and acceptance testing of FAA ELD systems only. For FAA power cable maintenance directives, refer to FAA Order 6950.22.

This specification applies to installation of medium and low voltage facility electrical supply power cables and associated equipment only. These systems provide facility power from the power supplier's primary service to the service entrance power panels of FAA facilities. For detailed information on the installation of non-ELD cable systems such as control cables, fiber optics telecommunication (FOTS) cables, communication cables, etc., consult with the office of primary responsibility (OPR) for guidance. The 2400-V shielded constant current power cables serving runway edge lighting fixtures have their own standards and are not the subject of this specification. Consult the appropriate office of primary responsibility and the airport circulars for guidance. For basic separation requirements of FAA utility power cable systems from non-electrical-power cable systems, consult the section of this specification entitled, "Separation of Cables" (5.5.10). When physically integrating non-ELD cables with power cables, do not assume all of the provisions of FAA-C-1391 apply without first coordinating with the appropriate OPR and the FAA onsite project engineer responsible for integration of multiple cable assets.

Non-ELD OPRs consist of:

a. **AJW-45 Ground-Based Navaids Group,**
b. **AJW-46 Lighting Systems Group,**
c. **AJW-52 Communications Systems Engineering Group,**
d. **AJW-53 Telecommunication Services Group,**
e. **AJW-55 Air-Ground Data Communications Group,**
f. **AJW-56 Air-Ground Voice Communications Group,**
g. **Others (as applicable).**

2. APPLICABLE DOCUMENTS

2.1 General

Due to the continuous updating of Government documents, the FAA Contracting Officer and/or the FAA Project Engineer must specify the document version and publication date current at the time of contract award or project design. The documents below form a part of this specification. Some of the FAA documents listed are out of date but are still applicable; reference the notations next to each reference provided. FAA tailoring organizations should consult with the offices of primary responsibility to obtain the most recent applicable documentation.

2.2 Order of precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Government documents

The following citations are government documents that are used as references in this specification.

2.3.1 FAA orders, standards, specifications, and handbooks

The following FAA orders, standards, specifications, and handbooks form a part of this document to the extent specified herein. Unless otherwise stated, requirements contained in these documents are as cited in the project solicitation or contract. (Copies of FAA orders, standards, specifications, handbooks, drawings, and other applicable FAA documents may be obtained from the Contracting Officer issuing the invitation-for-bids or request-for-proposals. Requests should fully identify the material desired; for example: specification, standard, amendment, drawing numbers [drawings possessing standard FAA signature block], and dates. Requests should cite the invitation for bids, request for proposals, the contract involved, or other source of the requested material.)

2.3.1.1. ORDERS

JO 3900.XX	Air Traffic Organization Electrical Safety Program [Future]
JO 6750.16	Siting Criteria for Instrument Landing Systems
JO 6950.27	Short Circuit Analysis and Protective Device Coordination Study [contact PSG Systems Engineering for arc flash calculations]

2.3.1.2 STANDARDS

FAA-STD-XXX	Underground Electric Line Distribution (ELD) Systems [Future]
FAA-STD-019	Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities

2.3.1.3 ADVISORY CIRCULARS AND SPECIFICATIONS

150/5300-13	Airport Design
150/5320	Surface Drainage Design
150/5370	FAA Standards for Specifying Construction of Airports
FAA-E-113	Poles, Wood, Treated
FAA-E-2793	Cable, Electrical Power, 2,000 to 35,000 Volts
FAA-E-2013	Cable, Electrical Power, Exterior 600 Volts

2.3.1.4 HANDBOOKS

FAA-HDBK-XXX	Underground Electric Line Distribution (ELD) Systems [Future]

2.3.2 Other Government documents, drawings, and publications

The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American Association of State Highway & Transportation Officials Specifications

AASHTO HB-17	Standard Specifications for Highway Bridges.
AASHTO HS-20	Standard Specifications for Highway Bridges

Occupational Safety and Health Administration Codes

Part 1926	Safety and Health Regulations for Construction.

Military Specifications

MIL-I-3825	Insulating Tape, Self-Fusing
DLA A-A-50563	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
DLA A-A-59213	Splice Connectors
DLA A-A-59214	Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated with Corrosion-Resistant Finish)
DLA A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
DLA A-A-59551	Wire, Electrical, Copper (Uninsulated)
Navy A-A-59827	Topside Conduit (Flexible) and Conduit fittings, Electrical: Composite Based (Non-metallic)
UFC 3-350-03FA	Electrical Power Supply and Distribution
UFC 3-600-01	Fire Protection Engineering for Facilities
UFGS 26 12 19.20	Single-Phase Transformers
UFGS 26 12 19.10	Three-Phase Transformers
UFGS 33 70 02.00 10	Electrical Distribution System, Underground

Federal Specifications

W-C-375/3	Circuit Breakers, Molded Case; Branch Circuit and Service
W-S-865	Switch, Box (Enclosed), Surface Mounted
WW-C-566	Conduit, Metal, Flexible
WW-C-581	Class 1 Type A with Standard for Electrical Rigid Metal Conduit - Steel, UL 6

2.4 Non-Government publications

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American National Standards Institute (ANSI) Standards

ANSI 6	Standard for Rigid Metal Conduit. (Same as UL 6)
ANSI 467	Standard for Grounding and Bonding Equipment. (Same as UL 467)
ANSI 514	Fittings for Cable and Conduit. (Same as UL 514)
ANSI 651	Schedule 40 and 80 Rigid PVC Conduit. (Same as UL 651)
ANSI A14.3	Safety Code for Fixed Ladders
ANSI C2	National Electrical Safety Code (NESC). (Same as IEEE C2)
ANSI C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV). (Same as IEEE C62.11)
ANSI C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits. (Same as IEEE C62.22)
ANSI C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems (Same as IEEE 1299/C62.22.1)
ANSI C62.41	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits. (Same as IEEE C62.41)
ANSI C80	Rigid Steel Conduit – Zinc Coated. (Same as NEMA C80)
ANSI C119.1	Sealed Insulated Underground Connector System Rated 600 Volts. (Same as NEMA C119.1)
ANSI FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies. (Same as NEMA FB1)
ANSI RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit. (Same as NEMA RN 1)
ANSI S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV (Same as ICEA S-97-682-2007)

ANSI TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation. (Same as NEMA TC 6 & 8)
ANSI Z535	Safety Alerting Standards. (Same as NEMA Z535)

American Society of Civil Engineers Standards

CI/ASCE 38-02	Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

American Society for Testing & Materials (ASTM) Standards

ASTM A48	Standard Specification for Gray Iron Castings.
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors
ASTM C267-97	Standard Test Methods for Chemical Resistance of Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C478	Standard specification for Precast Concrete Manhole Section (AASHTO No. M199)
ASTM C579-96	Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C580-93	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM C990	Standard Specification for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1056	Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D2444-93	Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM F512	Standard Specification for Smooth-wall PVC Conduit and Fittings for Underground Installation
ASTM 1962	Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles
ASTM F2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit

Institute of Electrical and Electronics Engineers (IEEE) Standards

IEEE C2	National Electrical Safety Code (NESC)
IEEE-48	Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE-100	The Authoritative Dictionary of IEEE Standards Terms
IEEE-386	Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600V
IEEE-400.2	IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE-400.3	Guide for Partial Discharge Testing of Shielded Power Cables in a Field Environment
IEEE-404	Standard for Power Cable Joints
IEEE-525	Cable Systems in Substations
IEEE-835	Power Cable Ampacity Tables
IEEE C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).

IEEE C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits
IEEE 1299/C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems
IEEE C62.41 (Formerly IEEE 587)	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits

Insulated Cable Engineers Association (IECA) Standards

ICEA S-94-964	Concentric Neutral Cables Rated 5-46 kV
ICEA S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV

International Electrotechnical Commission (IEC) Standards

IEC 60071-2	Insulation coordination Part 2: application guide.

National Electric Manufacturers Association (NEMA) Standards

RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit
FB1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
TC 2	Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 AND EPC-80)
TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation
TC 7	Smooth-Wall Coilable Electrical Polyethylene Conduit
TC 9	Fittings for PVC Plastic Utilities Duct for Underground Installation
TC 14	Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
NECA/NEMA 605	Recommended Practice for Installing Underground Nonmetallic Utility Duct

Underwriters' Laboratories (UL) Inc. Standards

UL 6	Standard for Rigid Metal Conduit
UL 467	Standard for Grounding and Bonding Equipment
UL 514	Fittings for Cable and Conduit
UL 651	Schedule 40 and 80 Rigid PVC Conduit

National Fire Protection Association (NFPA) Standards

NFPA-70	National Electric Code (NEC)
NFPA-70E	Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems
NEC Hdbk	Art. 110.16, Flash Protection
NEC Hdbk	Art. 344.10, Rigid Metal Conduit: Type RMC
NEC Hdbk	Art. 280, Surge Arrestors, Over 1 kV

3. GENERAL

3.1 Definitions

Unless otherwise specified, electrical and electronics terms used in this specification, and on the drawings, shall be as defined in IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms.*

In the text of this specification, the words "conduit" and "duct" are sometimes used interchangeably and have the same meaning.

In the text of this specification, "medium voltage cable splices" and "medium voltage cable joints" are used interchangeably and have the same meaning.

For the purposes of this specification, "FAA electrical line distribution systems (ELD)" shall be defined as:

FAA owned and operated electrical power distribution systems (underground or overhead) running from a power source to FAA facility load(s). An ELD may include some or all of the following: power cable; transformers; sectionalizers; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Intra-facility wiring, runway edge lighting cables, and FOTS and system cables, such as MALSR or ALSF loop cables are not included as part of ELD.

The demarcation point between an FAA ELD system and FAA facility premises wiring on an airport can be ambiguous. When in doubt, consult AJW-22, Power Services Group, Power Cable Program.

3.2 Submittals

Submittals are limited to those necessary for quality control (see Appendix E). Submittals marked A are required. For submittals marked B or C, the FAA task or contract specifier shall evaluate the contract for each kind, voltage, or type of submittal used on the project and make a determination as to whether the submittal is required. Examples given are not limited to those shown in parentheses:

"A" indicates that the submittal is required.

"B" indicates that the submittal is required, unless specifically deleted by the contract specifier.

"C" indicates that a submittal is not generally required because it is expensive and/or time consuming (i.e., a special case). If the submittal is required, the contract specifier shall show the required submittal on the submittals matrix (Appendix E) and in the contract documents (as a CLIN item).

a. Contractor-generated design data (ANSI C2 and FAA-STD-032, Para 3.1.13)
   1. Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2) [A]
   2. Design assumptions and parameters (FAA-STD-032) [B]
   3. Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc) [C]
   4. Design calculations (FAA-STD-032) [A]
   5. Contractor-generated design drawings or sketches. [A]
b. Cost estimates [A]
c. Medium voltage cable [A]
d. Medium voltage cable splices and joints* [A]
e. Medium voltage cable terminations* [A]
f. Conduits [A]
g. Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc) [A]
h. Switch pads and sectionalizers [A]
i. Transfer switches (automatic and manual) [A]
j. Transformers [A]
k. Surge arresters [A]
l. Live end caps or protective caps [A]
m. Precast concrete structures [A]
n. Sealing Material [B]
o. Manhole frames and covers [A]
p. Hand hole frames and covers [A]
q. Cable supports (racks, arms and insulators) [A]
r. Protective devices and coordination study [A]
s. As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system. [A]
t. Electrical equipment factory test reports [A]
   1. Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13). [A]
   2. Transformers [A]
   3. Switchgear, sectionalizers [A]
   4. Disconnects [A]
   5. Other applicable components [B]
u. Field acceptance checks and tests (see Appendix C) [A]
v. Arc-proofing test for cable fireproofing tape [C]
w. Cable installation plan and procedure (use cable installation plan only when pulling cable between manholes; do not use for pulling from pole riser to manhole only):
   1. Site layout drawing with cable pulls numerically identified [B]
   2. A list of equipment used, with calibration certifications [A]
   3. The manufacturer, type, and quantity of lubricant used on pull [B]
   4. The cable manufacturer and type of cable [A]
   5. The dates of cable pulls, time of day, and ambient temperature [C]
   6. The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table cable pulls may be submitted. [A]

7. The actual cable pulling tensions encountered during pull [A]
8. Certificates (tensiometer calibration, VLF tester calibration, etc) [A]

x. Cable splicer/terminator qualifications* [A]
y. Cable installer qualifications* [A]
z. Project design drawings [A]

*Note: The contractor shall provide the product drawings showing details of the connecting methods to be used, and a statement of the experience of the contractor in making connections on underground systems with the proposed product. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable. Products shall meet the latest editions of applicable standards as follows:

APPLICATION STANDARD (USE LATEST ISSUED)	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

3.3 Quality assurance

All work shall comply with the National Electrical Code (NEC) and IEEE C2/National Electrical Safety Code (NESC) for components and installation. To the maximum extent practicable, furnish products that are listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environment in which the products are installed. Use of nonlisted components will not be allowed unless (1) it is demonstrated that listed components are not available, and (2) the FAA preapproves such components before installation. Approval shall be at the discretion of the FAA.

3.3.1 Quality plan

The contractor shall submit a Quality Plan in compliance with ISO 9001, *Quality Management Systems Requirements*. This plan will allow the FAA to identify the stages at which the FAA requires carrying out an inspection or witnessing a test. The plan shall cover all relevant stages of personnel qualification, design, coordination, supplier selection, manufacturers' acceptance testing, site inspection, site quality control testing, and commissioning. The plan shall identify relevant suppliers by name, components supplied, country of origin, and whether suppliers and supplied components are quality assurance certified.

3.3.2 Quality control

The quality of the equipment installed shall be controlled at the manufacturers' plants and at the project site to ensure that it meets the required specifications. The quality of civil engineering work, such as trenching, ducting, and other operations, shall be inspected by the FAA and approved after each major construction step. The contractor shall inform the FAA of manufacturing/shipping schedules and shall offer representatives of the FAA the opportunity to witness acceptance tests. These tests shall be performed on a statistically meaningful number of samples, as specified by FAA engineers. After receipt of equipment shipment and prior to

installation, the contractor shall subject equipment to a thorough visual inspection. An FAA representative shall be notified in advance and afforded the opportunity to be present and witness this step. Nameplates and markers shall be checked against the required specifications, and deviations brought to the FAA's attention. At the FAA's request, quality control checks, including acceptable electrical measurements (such as cable insulation resistance tests and surge protection leakage current measurements) shall be performed and reported. After the installation of cable systems is completed, acceptance/commissioning tests shall be performed.

All equipment and materials shall be subject to acceptance through the manufacturers' certification of compliance with applicable requirements when so requested. The requirements of this standard shall be considered as minimum requirements and shall not relieve the contractor of the responsibility to furnish and install higher grades of materials than specified when so required by the contract drawings and specifications. The installation shall conform to the most stringent requirements of the National Electrical Code (NEC), the local electrical codes, NFPA-70E, and applicable ANSI and IEEE standards, e.g., the National Electrical Safety Code (NESC), as well as other relevant guides and standards as listed in Section 2.

3.3.3 Qualifications of personnel

3.3.3.1 Designers

The design team shall have at least one engineer with significant experience in medium voltage design, review, and construction management. The engineer shall have worked with electrical power systems, and shall have designed electrical distribution systems whose reliability, maintainability, availability, and fault tolerance are of a similarly high level to those found in campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities. The design engineer shall have the ultimate responsibility for the construction set (specifications, drawings, and cost estimates) and installation quality control. Drawings and engineering documents published by a non-FAA entity shall be signed by a registered professional engineer with knowledge and qualifications tailored to underground medium-voltage and low-voltage electrical distribution systems. Drawings and engineering documents published by a non-FAA entity shall be signed as approved by FAA Engineering Services or a representative of the PSG ELD/Power Cable Program upon design acceptance. Drawings ready for release for construction shall incorporate the project's design acceptance drawings by reference.

3.3.3.2 Installation Crew

Experienced personnel regularly engaged in underground electrical distribution system work shall perform the installation. Personnel exclusively or mainly trained in overhead line work, or low voltage facility wiring work, are not sufficiently qualified to install FAA medium-voltage underground electrical distribution systems. Workers shall be properly licensed where required by law. Only qualified personnel may work on electric circuit parts or equipment being installed.

A qualified person is one who has skills and knowledge related to the construction and operation of the FAA's electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. Management personnel shall be responsible for authorizing the qualified personnel to perform a task. Besides completion of Occupational and Safety and Health

Administration (OSHA)/FAA required electrical safety training for qualified personnel, those persons authorized to work on FAA ELD systems shall meet the requirements of a Qualified Person as mandated by OSHA and as discussed in NFPA 70E.

Along with training, personnel performing medium voltage work on FAA ELDs shall have: (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, including wire and cables, (2) the skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors or parts, (3) knowledge of the safe approach boundaries, work clearances, and voltages involved, (4) familiarity with construction and operation of equipment and the hazards involved, (5) familiarity with electrical safety related work practices and precautionary techniques, (6) familiarity with proper use of personal protective equipment (PPE), arc flash, insulating and shielding materials, (7) familiarity with the proper use of insulated tools and test equipment, (8) ability to make good decisions in determining the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely, (9) familiarity with safety precautions associated with confined spaces, (10) knowledge of skills and techniques regarding how to select and use a voltage detector and phase meter, (11) familiarity with mechanical aspects of ELD installation work such as trenching, boring, excavation around existing utilities and structures, manhole rigging, and pulling cable, and (12) CPR training and basic training for emergency dispatch if an electrocution or confined spaces injury occurs.

Cable termination and splicing shall be performed only by experienced and qualified medium/high voltage electricians experienced in underground distribution systems. Before cable splices/terminations are made, the FAA may request an example splice and/or termination be made to demonstrate the electricians' qualifications. In order to qualify the splicer, this example splice and/or termination shall comply with the requirements of accessory manufacturers, and pass the requirements of IEEE standards 48, 386, and 404 with respect to partial discharge.

3.3.3.3 Inspectors and Testing Personnel

Inspectors of the FAA ELD distribution systems shall have knowledge and experience in quality control activities related to the inspection of cables laid in trenches such as are found at large campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities; shall perform quality control activities during installation and preacceptance of medium and low-voltage switchgear and sectionalizers, protective devices, power distribution transformers, surge arrestor equipment, and motor control centers; shall review functional tests of electrical equipment and conduct inspection and preacceptance of electrical drawings, termination drawings, and cable schedules; and shall interpret the various drawings used in the projects for executing and recording the work.

Test personnel shall be qualified persons meeting the requirements stipulated in Appendix C.

3.3.4 Receiving, storing, and protecting

The contractor shall receive, store, protect, and handle products according to National Electrical Contractors Association NECA 1, *Standard Practices for Good Workmanship in Electrical*

Construction, and NECA/NEMA 605, *Recommended Practice for Installing Underground Nonmetallic Utility Duct.*

3.3.5 Sequencing and scheduling

The contractor shall:

1) Notify the FAA resident engineer to schedule inspection of each duct bank or duct bank segment before concrete is placed.

2) Provide the FAA resident engineer with reasonable notification before the anticipated date of acceptance testing of the newly installed replacement ELD system so that arrangements can be coordinated with the testing contractor.

3.3.6 Cable testing

3.3.6.1 Government-furnished cable

If government-furnished power cable is delivered to the contractor, the contractor shall test the cable on the reel and report electrical or physical cable defects within two weeks of cable receipt. If adequate cable lengths are unavailable for testing on the reel, a visual inspection shall be made and damage reported to the FAA. The required tests shall then be made immediately after unreeling. Defects discovered when installing the cable shall be reported to the FAA in accordance with the contract provisions.

3.3.6.2 Contractor-furnished cable

Single and multi-conductor power cables furnished by the contractor shall conform to the FAA specifications given in the Products section of this specification.

Cable shall meet the following minimum requirements:

a. Copper conductors.

b. Thermoplastic, thermosetting, or silicon rubber insulation.

c. Neoprene, polyethylene, or vinyl jacket for normal areas, and polytetrafluoroethylene (PTFE) (Teflon®) jacket in areas exposed to fuel, oil, solvent or chemical leakage, excessive groundwater, or extremely acidic soil.

d. For cables with rated voltages to 8 kV, cable insulation shall have a minimum continuous voltage withstanding capability of four times rated voltage (but not less than 150 volts). For rated voltages above 8 kV, insulation shall have a minimum continuous voltage withstanding capability of three times rated voltage. Cable voltage surge capabilities shall be 15 times rated voltage for voltages to 8 kV, nine times rated voltage for voltages above 8 kV through 15 kV, and seven times rated voltage for voltages above 15 kV through 25 kV. Whenever a cable is covered by applicable ICEA/NEMA specifications,

the cable shall pass the test requirements for such cable. In addition, the installed cable shall satisfy after-installation acceptance tests as specified below, and in Appendix C.

e. The pull strength of the completed cable(s) shall exceed the expected installation forces by a minimum of 50 percent.

3.3.6.3 Acceptance testing of new cable

Following installation, the contractor shall perform cable testing in the presence of the FAA. The contractor shall furnish necessary test instruments except where otherwise indicated in the project plans. Only currently calibrated instruments shall be used for cable testing. A laboratory approved by the measurement instrument manufacturer shall have performed instrument calibration. When conducting FAA-authorized third-party testing, offline partial discharge testing shall constitute the final acceptance test after completion of the installation.

Testing shall be completed on contractor-installed cable before connection is made to existing cables. If warranted, the FAA will test existing cables and provide the results to the contractor through the contracting officer prior to the contractor splicing or connecting cables he has installed to existing cables.

Certain acceptance tests classified as "destructive" by the IEEE shall only be conducted on newly installed cables. Such tests shall only be conducted within the test constraints given in Appendix C. Destructive tests shall not be performed on in-service (five years or older) power cables.

3.3.6.4 Acceptance testing of new power cables above 2000 volts

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

New FAA underground, shielded, medium-voltage power cables rated 2000 volts and above shall be subjected, after installation but before connection to terminal equipment, to the following acceptance tests:

a. Continuity test for cable conductor, shield, and armor, using an ohmmeter type instrument. See FAA Order 6950.22 for parameters and test equipment.

b. Limited-voltage DC insulation resistance test using a Megger ™ type instrument. This test is formulated to apply and hold a DC voltage on the cable for a specified time, while measuring insulation resistance. See Appendix C for test description and processes.

c. One of the following tests:

a. Very low frequency (VLF, 0.1 Hz) AC high-potential withstand "pass/fail" test. The purpose of this type of test is not to ensure cable system future performance but simply to

reassure the construction team that the line is not grounded/shorted before energization. The test shall be performed after cable system installation, including terminations and joints, but before the cable system is placed in normal service. See Appendix C for test description and procedures.

b. If third-party partial discharge acceptance testing is authorized, a diagnostic 50/60 Hz, off-line partial discharge test. This test can localize and determine the severity of any defects in the new installation. Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm shall be a qualified contractor preauthorized by the FAA. See Appendix C for test description and procedures.

3.3.6.5 Acceptance testing of new power cables 600 volts and below

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

All low-voltage (≤ 600 V) power cables shall measure not less than 50 megohms resistance between conductors, and between conductors and ground (see FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Measurements shall be taken at not less than 500 volts DC and not more than 1000 volts DC. This test does not constitute proof that the system is free from insulation defects but rather supplies evidence that the insulation was not damaged during the installation process.

3.3.6.6 Failure of cable under test

If the contractor-furnished cable fails to meet test requirements after installation, the contractor shall repair or replace, at his expense, the sections of cable proven defective.

If the government-furnished cable fails to meet test requirements after installation due to contractor's faulty installation practices, the contractor shall repair or replace the defective sections of cable at contractor's expense.

The installation contractor shall be responsible for retest costs if components are found to be substandard during acceptance test(s) as a result of contractor faulty installation practices.

4. PRODUCTS

4.1 Product options and substitutions

Alternative products may be substituted for product types that do not apply to the project. Consult with the airport authority and the local FAA project engineer.

4.2 Power cable

Single and multi-conductor power cables shall conform to the following FAA specifications:

a. FAA-E-2013 for single-and multi-conductor power cables used in exterior 600 volt applications.

b. FAA-E-2793 for single and multi-conductor power cables used in exterior 2,000 to 35,000 volt applications. Reference Section 4.2 for product factory certified test result reporting requirement.

4.3 Transformers

4.3.1 High voltage transformers (>600 volts)

4.3.1.1 Transformer design

ELD transformers are normally installed outdoors with proper clearance from structures. Transformers shall be "enviro-friendly" mineral-oil-filled or biodegradable electrical insulating and cooling-liquid filled. Choose less-flammable transformer liquids unless there is a specific requirement to do otherwise.

If the local site stipulates less flammable transformer liquids, the following section shall apply, use NFPA 70 for liquids having a fire point not less than 300 degrees C tested per ASTM D92 and a dielectric strength not less than 33 kV tested per ASTM D 877. Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate. The fluid shall be a biodegradable electrical insulating and cooling liquid classified by UL and approved by FM Approvals® as "less flammable" fluids. The fluid shall meet the following properties:

- Pour point: ASTM D 97, less than -15 degree C,
- Aquatic biodegradation: EPA 712-C-98-075, 100%,
- Trout toxicity: OECD Test 203, zero mortality of EPA 600/4-90/027F, pass.

Silicon-filled and R-temp filled transformers shall not be used for less-flammable applications.

Transformers shall be pad mounted and of dead front design. If two-compartment transformers are required, obtain preapproval from the lead Engineering Services engineer or the Power Services Group, AJW-22. Aluminum core construction is acceptable. Due to associated safety hazards, transformers of the pole-mounted style shall not be used for ground-level FAA ELD applications.

4.3.1.2 Transformer bases and cabinets

Use stainless steel bases and cabinets in most applications, unless otherwise specified. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.3.1.3 Warning signs and arc flash/shock hazard labels

For the enclosures of pad-mounted transformers having a nominal rating exceeding 600 volts, provide warning signs. After completion of arc flash hazard and shock analyses, label transformers with arc flash hazard and shock hazard warning information suitable to the particular installation.

4.3.1.4 Transformer losses

Transformers should meet the efficiency standards set forth in DOD's Unified Facility Guide Specification (UFGS) 26 12 19.20, *Single Phase Transformers,* Section 2.2.3.

4.3.2 Low-voltage transformers (<600 volts)

In FAA ELD systems, dry-type distribution transformers are used for buck boost applications or for short point-to-point distances for small loads of 600 volts or less. When used indoors, refer to FAA Specification FAA-C-1217, *Electrical Work, Interior.*

Transformers shall be mounted to allow for adequate ventilation (suitable for the local ambient temperatures).

4.4 Switchgear and sectionalizers

FAA ELD systems contain two types of switchgear: switch pads and sectionalizers. Both are fused devices used to de-energize equipment to allow work to be done and to clear faults downstream. More importantly, they isolate faulted line segments from a distribution system. These units shall be dead front-type units.

- Low-profile switch pads are typically used for single-phase applications.
- Sectionalizers are typically used for three-phase applications.

- Enclosures shall be outdoor rated or stainless steel, depending on location, meeting the requirements of ANSI C57.12.28. Use steel construction for typical installations. Use stainless steel construction for corrosive/salt environments.
- Pads or vaults shall be constructed of concrete or composite concrete-glass material. Concrete is preferred, but the latter may be used if approved by the FAA Resident Engineer and included on the drawings.
- Bases and cabinets shall be constructed of materials based on geographic location. Applications in dry locations shall employ steel; in wet locations, stainless steel.
    - Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.
    - In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.5 Service disconnecting means

A main disconnect switch (MDS) ensures that electrical service to a facility can be completely de-energized for service or maintenance.

- MDSs shall be outdoor rated or stainless steel. Enclosures shall be NEMA 3R for typical applications, NEMA 4X for corrosive/salt environments.
- Pads shall be constructed of concrete or polymer concrete composite material. Concrete pads shall be no less than 6 in. thick. Concrete pads shall be brushed, chamfered, and graded for drainage. Expansion couplers should be considered in areas prone to frost heaving or ground settling.

4.6 Terminations and splices

4.6.1 Terminations

All power cable terminations rated above 4000 volts or with an outer shield shall be made with an authorized stress-relief device. Cable terminations shall be of a prefabricated design. Special care shall be exercised to provide the proper ratings and physical dimensions.

4.6.2 Splices

For medium voltage power cables (600 volts and above), use cold-shrink splice kits meeting ANSI/IEEE Std. 404 (for a 15 kV rating). For power cables 600 volts and below, use heavy-wall

self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006. Alternatively, use a poured epoxy splice, or any other splicing means approved by ANSI standards.

4.7 Overcurrent protective devices

- For FAA ELD systems, the preferred protective devices are fuses. In transformers, fuses shall be immersion-type, current-limiting fuses, accessible from the exterior of the equipment.
- The specific type and size of protective device shall be selected based on a protective device coordination study and short circuit analysis, and as provided in the drawings.

4.8 Underground duct systems

The configuration of an underground duct system shall depend on the specific application. Conduit types used within FAA duct systems shall be of the size, material, and type indicated on the contract documents. Size of conduit shall always be indicated on the drawings. All conduit material shall be UL listed and installed in accordance with UL listings.

4.8.1 Concrete-encased rigid nonmetallic conduit

Rigid nonmetallic conduit consists of two types:

1) Concrete-encased Schedule 40 PVC conduit is preferred for ELD duct systems. To reduce costs or for special applications, direct-buried Schedule 80 PVC conduit may be used in lieu of concrete encasement.

2) High-density polyethylene (HDPE) is a rigid nonmetallic conduit commonly used for boring.

4.8.1.1 PVC conduit

PVC conduit shall meet the requirements of UL651 – *Schedule 40 and 80 Rigid PVC Conduit,* NEMA TC 2 – *Electrical Polyvinyl Chloride (PVC) Conduit.* Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.1.2 HDPE conduit

HDPE conduit shall meet the requirements of ASTM F2160-10/ASTM 1962-11/NEMA TC7.

4.8.2 Plastic-coated steel conduit

4.8.2.1 PVC coated RGS

Where situations warrant, such as when runway and equipment shutdown impacts are a consideration, PVC coated RGS may be used in lieu of concrete encased PVC duct. This substitution must be annotated on the drawings. Direct-buried rigid galvanized steel shall be

plastic coated. An acceptable alternative is RMC wrapped in half-lap fashion with pressure-sensitive 10-mil PVC-based corrosion protection tape.

PVC exterior coated, urethane interior coated, galvanized rigid steel conduit shall meet the requirements of NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.2.2 Fittings and conduit bodies
Use 40 mil PVC exterior coated, urethane interior coated, zinc-plated, threaded, malleable iron meeting the requirements of UL514B – *Fittings for Conduit and Outlet Boxes,* and NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.3 Direct buried rigid nonmetallic conduit

Direct-buried conduit shall be Schedule 80 PVC.

Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.4 Rigid metal conduit (RMC)

Above-ground exterior conduit shall be rigid steel conduit.

Conduit used in exterior applications such as in an equipment rack shall meet the RGS requirements of UL6 – *Rigid Metal Electrical Conduit,* and ANSI C80.1 – *Rigid Steel Conduit, Zinc Coated.*

RMC fittings and conduit bodies shall meet the requirements of UL514B and ANSI/NEMA FB1.

Fittings: Follow NEMA TC 9, NEMA TC 14, and ASTM F-512.

4.9 Corrosion protection tape

Use pressure-sensitive, 10-mil-thick, PVC-based tape for corrosion protection of metal conduit and fittings.

4.10 Insulating bushings

Use NRTL-listed insulating bushings with 105° C rated insulation. Apply insulated protective caps to any unoccupied bushings. Dust caps shall not be used as substitutes for protective caps.

4.11 Grounding bushings

NRTL-listed, galvanized malleable iron, 150° C rated insulated throat grounding bushings with lay-in type ground cable lugs.

4.12 Sweeps

All sweeps shall be PVC-coated or tape-wrapped rigid galvanized steel (RGS).

Do not provide sweeps into a manhole. Vaults shall be considered for all transformer and switchgear applications wherever possible, eliminating the need for sweeps.

4.13 Duct spacers

Standard precast spacers ("chairs") shall be used for duct support and alignment. Duct spacers shall provide a 3-inch separation between the conduit and the ground. There shall be a minimum of 3 inches of concrete on bottom, sides, and top of duct.

4.14 Duct plugs

In unused ducts, use soft, expansible gasket material compressed with non-metallic plates and bolts to produce a positive seal against water and gas.

4.15 Duct sealant and joint filler

Use expandable foam duct sealant kits to prevent water and gas from entering manholes, vaults, or structures.

Use premolded joint filler to fill holes in and around conduit to keep rodents out of the ELD system. Use closed-cell expanded neoprene joint filler conforming to ASTM D1056 – *Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber*.

4.16 Underground duct and cable warning tape

Furnish detectable underground warning tape for underground duct banks. Use aluminum-backed, 0.005 inch thick, underground warning tape with a red background color. Lettering shall be black and indicate the type service buried below:

"CAUTION BURIED ELECTRIC LINE BELOW"

Use tape width appropriate for the burial depth:

A. Three-inch wide tape for up to 18 inches depth.
B. Six-inch wide tape for up to 24 inches depth.

All direct buried cable shall be marked with extrusion-laminated underground marking tape. Tape shall be a minimum of six inches (6") wide and shall run continuously in the cable trench six inches (6") below the surface or as indicated on the project plans. Tape shall be bright red, and constructed of solid 100% pigmented plastic, and not an ink-coated plastic.

4.17 Pull wires and tape

For spare ducts, specify ¼ inch pull tape having a minimum tensile strength of 400 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc).

For ELD circuits that include raceways within vaults or other locations, raceway measuring/pulling tape may be used. Tape shall have permanently printed measurements in one-foot increments and minimum 1200 lb average breaking strength.

4.18 Precast electrical manholes and hand holes, accessories

4.18.1 Manholes and hand holes

Precast reinforced concrete electrical utility structures shall be of the size and shape as detailed on the drawings in conformance with ASTM C-858 – *Standard Specification for Underground Precast Concrete Utility Structures*. Electrical manholes are typically 4' long, 4' wide, and 4' high, or as shown on the drawings. Electrical manhole sections shall conform to ASTM C-478.

4.18.1.1 Manholes/hand hole structures, frames, and lids

4.18.1.1.1 Airports handling aircraft with maximum departure/takeoff weight of 30,000 lb and above--For airports with a design aircraft maximum departure weight of 30,000 lb and above,* manholes/hand holes, frames, and lids located within the airport runway/taxiway safety areas (RSA/TSA) shall be of the aircraft-rated type, designed and certified for 100,000 lb (45,000 kg) wheel loads with 250 psi (1.72 MPa) tire pressure. (Refer to FAA Advisory Circular 150/5320-6, Appendix 3, *Design of Structures for Heavy Airplanes*). Clearly indicate on the drawings underground utility structures that will be subject to aircraft loading. For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, those structures shall be aircraft rated.

Outside the RSA/TSA, H-20 highway-rated manhole and hand hole components are permitted, provided an adequate proof load safety margin for the casting is met. First, live loading shall meet basic H-20 loading requirements per A.A.S.H.T.O. HB-17, *Standard Specifications for Highway Bridges*. The live load shall be that loading which produces the maximum bending and shear moments in the structure. H-20 design wheel load is a minimum of 16,000 pounds, or 80 psi. For the safety margin, the casting must meet AASHTO M306, which requires that it pass a proof load test of 40,000 lb applied on a 9x9-in. pad in the center of the casting. H-20 rated utility structures that do not meet the above requirements shall not be used.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

*Airports handling dual-wheel-landing-gear aircraft up to 60,000 lb maximum departure weight are permitted to use highway-rated manholes/hand holes and components in the RSA/TSA because the wheel load is distributed over four tires (60,000 ÷ 4 = 15,000 lb). Adequate safety margins must be met through proof loading. Refer to the H-20 loading requirements specified above.

4.18.1.1.2 Airports handling aircraft maximum departure/takeoff weight of 30,000 lb or below-- For airports with a design aircraft maximum departure weight of 30,000 lb or below (60,000 lb if dual-wheel landing gear), manholes/hand holes, frames, and lids located both within and outside the airport runway/taxiway safety areas (RSA/TSA) shall be of the highway-rated type, provided a safety margin for the manhole casting is added. Live loading shall be for H-20 loading with adequate safety margin as described in Section 4.18.1.1.1 above. Clearly indicate on the drawings underground structures that will be subject to aircraft loading.

For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, and the expansion is expected to accommodate heavier aircraft with maximum departure/takeoff weight of 30,000 lb and above (60,000 lb if dual-wheel landing gear aircraft), those structures shall be aircraft rated. Concurrently, existing non-aircraft-rated manhole/hand hole structures throughout the airport's RSA/TSA areas shall be retrofitted with aircraft-rated structures and components.

Outside the RSA/TSA in non-vehicular traffic areas, other types of enclosure structures (e.g., polymer concrete, nonreinforced concrete, or other) may be used provided (1) they meet ANSI Tier 22 (design/ test = 22,500/33,750 lb) specifications, and (2) have been approved by the FAA resident engineer.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

Manhole markings--Identify electrical power manholes and hand holes by "FAA Power" markings cast in the steel cover, or so identified with a die stamped, nominal one sixteenth inch (1/16") minimum thickness copper plate, brazed or fastened to the cover with a minimum of two 10-32 brass machine screws.

4.18.2 Manholes accessories

Frame and lids--Use heavy duty cast iron manhole frame with solid lid. Lid may be spring loaded. Alternatively, lid may consist of partitioned aircraft-rated lid segments, each segment capable of being lifted separately, facilitating easier and safer access.

Racks--Cable racks and cable support arms shall be furnished in the quantities and locations indicated by the drawings for each manhole. Racks shall be made of nonmetallic material (for example, PVC, plastic, or UL-rated glass-reinforced nylon). Saddle arms shall be as per the approved project drawings. Splices and cables shall be attached to cable racks.

4.19 Grounding cables

Depending on the application, ELD exterior grounding conductors shall be of the type and size required by applicable sections of FAA-STD-019.

a. For equipment grounding conductors, use 4/0 AWG bare stranded, soft temper copper cable per ASTM B 8, *Standard Specification for Concentric-Lay Stranded Copper Conductors.*

b. For guard wire, use 1/0 AWG bare copper, stranded.

c. For bonding conductors, use No. 2 AWG bare copper, stranded.

4.20 Ground rods

Ground rods ("grounding electrodes") shall be three quarter inch (3/4") by ten foot (10') long copper or copper-clad steel.

4.21 Weather heads on risers, drip loops

Risers feeding FAA owned underground distribution systems shall have weather heads installed. Each weather head shall have drip loops that loop no less than 6" below the weather head.

4.22 Electrical equipment enclosures

Bases and cabinets of electrical equipment shall be constructed of materials suitable to their geographic location.

Typical, dry environments--For typical dry conditions, mild steel bases and enclosures may be used. These provide protection against rain, sleet, and snow in outdoor applications.

Corrosive or wet environments—For typical wet (or wet and salt-corrosive) conditions, use stainless steel bases and enclosures.

Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.23 Equipment vaults and pads

Follow the drawings for specification and construction details of equipment foundation support structures. Specific applications are as follows:

4.23.1 Concrete vaults

For low-profile single phase transformers, use precast concrete vaults to facilitate ease of transition from duct bank system to transformer termination points. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.2 Concrete pads for transformers

Foundations of poured concrete pads for larger size transformers (>50 kVA) shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.3 Concrete pads for equipment racks

Foundations of poured concrete pads shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall be chamfered, brushed, and graded for drainage. Expansion couplers on protruding conduits should be considered in areas prone to frost heaving or ground settling. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

Prefabricated concrete pads with cutouts for cables can be used where frost heave is prevalent. Arrange for lift equipment to place the pads. Install cables in conduit and leave a slack length of cable in case the pad is displaced upward by ground frost.

4.23.4 Composite polymer concrete equipment pads

If approved by the FAA Resident Engineer and included on the drawings, lightweight polymer concrete flat pads and box bases that provide sufficient strength-to-weight ratios may be used. These units have cutouts and preinstalled mounting hardware. No extra equipment is required to lift the pads into position.

Composite pads/boxes shall be composed of cement mortar reinforced by alkali resistant glass fibers. The material shall incorporate a minimum of 4 percent by volume of alkali resistant glass fibers.

Composite pads/boxes shall meet or exceed a compressive strength of 11,000 psi per ASTM C579-96, a flexural strength of 1,800 psi per ASTM C580-93, and a modus of elasticity of 2,900,000 psi per ASTM C580-93. Composite pads/boxes shall also pass chemical resistance and impact resistance tests in accordance with ASTM C267-97 and D2444-93.

Composite pads/boxes shall not warp, support flame, rust, or be UV degradable. They shall have a waffle bottom design to permit loose earth to fill bottom voids to level and stabilize the pad. The pad/box shall not be affected by asphalt, road salts, fertilizers, transformer oil, other common chemicals, weather, sunlight or other normal service conditions to which they may be exposed. Composite pads/boxes shall be capable, with equipment installed, of withstanding temperature variations of -40 degrees C (-40 degrees F) to +65 degrees C (149 degrees F) without cracking, splitting, or deforming. They shall not be designed and constructed so as to trap or hold water and shall be able to withstand repeated freeze-thaw cycles.

4.24 Bollards

Bollards shall be used only where it is necessary and/or as required by the airport authority to protect electrical equipment and enclosures from field vehicle damage or other mechanical damage. Bollard use and placement shall be as specified on the drawings or as determined by final location of equipment. Unless otherwise specified, use 4-in. diameter steel pipe filled with concrete. Bollards shall be placed 3 ft deep and extend 4 ft above ground level. Premanufactured plastic jackets shall cover each bollard.

5. EXECUTION

5.1 Scheduling of work

Airport runways must remain in operation during certain periods. Contractors shall proceed in a manner that produces minimum disruption to the FAA and airport operations. During construction activity, contractors shall coordinate work through the FAA Resident Engineer, the airport authority, air traffic control tower, airport security, and other contractors as defined by the contract documents. Work performed within the RSA/TSA of an active runway may require runway/taxiway closing. Advance notice of proposed work near an active runway shall be required to be given by contractors to the FAA.

5.2 Existing FAA buried cable and ducts

5.2.1 FAA documentation

The contract documents define the drawing format used by the FAA to record the location of buried cable and ducts. The contractor shall use the FAA format during the course of work to ensure the accurate location of the new installations as described on the FAA drawings. The contract documents shall include copies of FAA drawings for the area of work. Contract drawings and engineering documents published by a non-FAA entity shall be approved by the FAA project engineer.

5.2.2 FAA marking of known buried cables and ducts

All known FAA power and control cables leading to and from an operating facility will be marked in the area of work by the FAA for the information of the contractor before starting work. The FAA will mark these cables once for the contractor. It shall be the contractor's responsibility to maintain these markings throughout the course of the project. Airport mowers may be expected to be in use by airport personnel throughout the duration of the work, keeping markers visible. FAA is responsible for marking FAA cables ONLY. The contractor shall be responsible for marking other cables and utilities in the work areas through a third party location service.

5.2.3 Other buried cables, ducts, piping and items

Locating utilities--The contractor shall be responsible for contacting the utilities prior to starting work and for confirming the location of existing utilities and other items that may be buried in the area of work. Along an area suspected of having utilities of any sort, the contractor shall hand dig or use other authorized low-impact digging system. The airport authority shall be contacted to locate those items owned or known by the airport to exist.

Avoiding buried structures--The contractor shall take precautions to protect existing underground (buried) items including but not limited to; fuel tanks, water lines, cables, ducts, and structures.

Buried items shall be protected from damage for the duration of work. The contractor shall immediately repair, with equal material by skilled workmen, those items damaged by the contractor or subcontractor.

Procedure for making repairs during installation--Prior authorization from the FAA shall be obtained for the materials, workers, time of day or night for making repairs, method of repairs, and permanent repairs the contractor proposes to make. In the event of inadvertent damage, the contractor shall immediately stop work and notify the FAA and utility when appropriate. Repair work shall be inspected and authorized by the FAA with the concurrence of the affected utility company, airport, or other owner(s) of the damaged item(s).

Cables to be abandoned—When a DEB cable is identified to be abandoned, where possible it shall be disconnected and left in place. Unless otherwise directed, cut the cable, armor, and ground wires back 10 feet at each end. Where possible, exothermically weld the cable ends to ¾" by 10' ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

When a cable in duct is identified to be abandoned, ground the cable, armor, and ground wires at both ends. Where possible, exothermically weld the cable ends to ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

Replaced cables—Replaced cables shall trace the same routing path as previously employed. Should there be a need to divert from the previous route, careful planning shall be exercised, especially in areas where utilities, communications, control, and NAVAIDS systems such as Glide Slope and Localizer facilities are installed or planned to be installed in the future. Approval from the office of primary interest is required.

5.3 Safety during construction and testing

All necessary site work included in the overall scope of work, from delivery to site to final authorization, shall undergo a safety risk assessment. A detailed, site-specific, Safety Risk Assessment shall be submitted by the contractor to FAA for final authorization no fewer than 3 weeks prior to commencement of on-site work. During construction, installation, and testing, the contractor shall comply with the safety rules of FAA (FAA Order JO 3900.XX, FAA Advisory Circular AC 150/5370-2) and those dictated by OSHA (Part 1926), NEC, ANSI/IEEE, and ANSI C2 (the NESC). The contractor shall be responsible for the implementation of FAA-authorized items in the Safety Risk Assessment document.

5.4 Excavation and trenching

The following are general excavation and trenching requirements. Note paragraphs that follow for particular requirements for either (1) direct earth buried cables, or (2) underground duct cables.

5.4.1 Depth requirements

IEEE ANSI C2 (part of the National Electric Safety Code) specifies the minimum legal depth requirements for medium-voltage power cable during installation. Tailoring organizations shall evaluate site-specific requirements and follow the following standards in order of precedence: (1) IEEE ANSI C2, then (2) paragraphs below, then (3) local standards if applicable.

Conduits shall meet the following minimum standards:

a. Unless otherwise specified due to soil conditions or other circumstances, cables, conduits, and ducts shall be buried to the minimum depth to their top as specified by the following paragraphs b through g. In the event that achieving the minimum depth is not feasible, follow the direction of the FAA Resident Engineer.

b. Top of direct-earth buried (DEB) conduit or cables under 600V shall be a minimum of twenty four inches (24") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

TABLE I. Burial depths (source: ANSI C2)

Voltage (phase to phase)	Depth of burial	
	(mm)	(in.)
0 to 600	600	24
601 to 50,000	750	30

c. Top of direct-earth-buried conduit or cables over 600V shall be a minimum of thirty inches (30") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

d. If finished grade has not been established before the cable trenches are excavated, it is the contractor's responsibility to determine what the final finished grade elevation will be and excavate the trench deep enough to meet the depth requirements at the end of the project.

e. Underground concrete-encased duct, and duct consisting of PVC Schedule 80, HDPE, or RGS conduit, shall be installed so that the top of the conduit is buried at not less than twenty-four inches (24") below finished grade.

f. Additional requirements for all ducts: concrete-encased duct, rigid steel conduit, or PVC conduit shall be installed so that the top of the conduit is buried as follows:

1. When installed under runways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

2. When installed under taxiways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

3. When installed under other paved areas, in accordance with Table I or as required by the local jurisdiction.

4. For railroads and state-owned highways, at the minimum depth below grade as specified by those entities.

5. Where local conditions require unusually deep burial of ducts, contractor shall discuss the situation with the FAA project engineer and obtain preauthorization.

g. In northern climates where deep trenching is cost prohibitive, use a standard depth of not less than 24 inches (24") from top of duct, cable, or conduit to finished grade.

h. Cables shall not be direct buried under paved areas, runways, taxiways, roadways, railroad tracks, or ditches. Where cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in rigid steel conduit, concrete-encased PVC, steel conduit, or high-density polyethylene (HDPE) conduit, as defined by the contract documents. Where cables cross under railroad tracks, such cables shall be installed in accordance with the requirements of the railroad authority. Cables under railroad grades may be installed in reinforced concrete-encased ducts, rigid galvanized steel sleeves, or HDPE conduit, subject to the requirements of the railroad authority. HDPE must be of sufficient crush strength to withstand expected static and dynamic loads over the expected lifetime of the cable without deformation. For directional boring under railroad and roadway grades, standard dimension ratio (SDR) 11 or 9 shall be used depending on conditions and conduit diameter. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness. Damage to conduit coatings shall be prevented by providing ferrous pipe jackets or by predrilling. Ducts shall extend at least 1 foot beyond each edge of paving and at least 5 feet beyond each side of railroad tracks.

i. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering. Cables may be pulled into duct from a fixed reel where properly sized rollers are provided in the trench. Where cuts are made in paving, the paving and subbase shall be restored to their original condition. Where cable is placed in duct (for example, under paved areas, roads, or railroads), ducts shall be made to slope in order to drain.

5.4.2 Survey requirements

5.4.2.1 Recording of data

The ELD project record shall consist of (a) information entered in computer-aided design and drafting (CADD) systems, (b) manual plotting onto the FAA drawing set, (c) Global Positioning System (GPS) data, (d) Geographic Information System (GIS) information or databases, and/or (e) other appropriate documentation as set forth in the contract documents.

Placement of markers--Drawings shall record positions of markers placed in or on top of direct earth buried (DEB) power cable trenches, and at duct bank manholes and hand holes. The markers shall be identified on the drawings by a small circle with a "P" in the center for power cable, "C" for control/fiber cable, "R" for coaxial cable, "S" for special purpose points, and "T" for telecommunications.

DEB cable--DEB cable trenches shall be identified on the drawings with text boxes pointing to the trench indicating what is in the trench. If there are several cables in the trench, each cable shall be called out. Power cables shall be identified by the actual working voltage of the cable and not by the cable insulation rating. Anything unusual, peculiar, or unique about the cable runs shall also be called out in the drawings.

Duct banks--Duct banks shall be plotted on the drawings. Duct banks that are installed for future use shall have text boxes pointing to them indicating that they are future-use duct banks. In the case of a duct bank where the duct bank is not a straight line between the manholes or hand holes, enough markers of the type specified herein shall be installed to accurately depict the routing of the duct bank.

Manholes, hand holes, and splices--Manholes shall be identified on drawings by a small square with an "MH" in the center. Hand holes shall be identified by a small square with an "HH" in the center. Where manhole and hand hole numbers are provided on the contract drawings, they shall also be called out on the completed cable drawing. Splices made in manholes and hand holes shall be shown on the cable drawings.

Abandoned cables--The contractor shall provide data on the types and locations of abandoned cables in places where they affect the excavation of new trenching, such as at points of intersection with other structures, including runways, taxiways, concrete pads, utility pathways, roads, etc. This information shall be included on the drawings.

5.4.2.2 Survey points

The contractor shall record the survey point of each manhole using GPS coordinates. At each major change of direction of the cable circuit, a manhole shall be present and its location surveyed and recorded. Surveying and data gathering for this purpose shall be completed before a trench or structure is backfilled.

If for some reason the cable path deviates from a straight line between manholes and is not capable of being traced using tracing equipment, the deviation should be recorded as a survey point on the drawings for future reference. Where the cable terminates to a building, a transformer, an antenna, a light bar, an outside demarcation cabinet, switch rack, or other similar device, the survey shall include the four corners of the device or facility where it terminates. A tolerance of plus or minus five inches (± 5") will be acceptable for describing the cable path.

Special-purpose points--Special-purpose points may be used to indicate points such as splices or entrances to duct banks in records and on the drawings. Special-purpose points shall be accompanied by a text box to describe the function of the specific point.

5.5 Underground duct systems

Power distribution cables at FAA installations shall be installed in underground duct systems. Unless preauthorized per the drawing set and construction specifications, direct earth burial (DEB) of power distribution cables is prohibited. If preauthorized, any DEB construction shall meet the requirements in Section 5.6.

5.5.1 Preparation and excavation for underground ducts

In preparing to install underground ELD ducts, contractor shall meet the industry standards given in this section. Contractor shall also work with FAA to contact the owner for their requirements, coordinating underground ELD duct work to avoid interference with other airport projects and existing utilities. The contract specifier shall work with the Power Cable (ELD) Program Office to ensure coordination of work with other FAA programs that may have an interest in using the same duct system or trench.

The contractor shall excavate trenches for underground ducts as follows:

a. To the depth specified in paragraph 5.4.1c.

b. Install underground duct bank systems according to the NEC, the NESC, NECA/NEMA 605 (*Recommended Practice for installing Underground Nonmetallic Utility Duct)*, ANSI/IEEE C2, and other requirements in this section.

c. Verify routing and termination locations of duct banks before excavation for rough-in.

d. Verify that field measurements are as shown on the drawings.

e. Position trench so concrete envelope of duct banks shall have the following minimum horizontal and vertical separations from parallel or perpendicular runs of other utility pipes or conduits (Table II). Note: Measurements are guides only; check with local authorities and the owner for their specific requirements.

f. Make trenches of sufficient width to receive work to be installed and provide specified concrete coverage on sides.

g. Conduit or castings required under roadways or railroads shall be installed by boring. Jacking of conduit is not allowed. Conduits bored under roads off airport property shall be a minimum of thirty inches (30") below finished grade, or as required by the local jurisdiction.

h. Backfill excavations for duct banks and manholes in 6-inch layers using excavated soil. Remove roots, rocks and sharp objects. Furnish coarse sand as required for additional backfill material.

i. Moisture condition backfill soil and compact to 95% of maximum density under paved areas and 90% of maximum density under unpaved areas.

j. Overfill excavations to allow for settling.

k. Firmly tamp backfill in the separation area.

l. Restore area.

TABLE II. Spacing of power cable ducts from other utilities.

UTILITY TYPE	PARALLEL LINES	PERPENDICULAR CROSSINGS
Water	36 inches horizontal separation	24 inches
Gravity Sewer	36 inches horizontal separation	24 inches
Force Main Sewer	36 inches horizontal separation	24 inches
Storm Drain	36 inches horizontal separation	24 inches
Natural Gas	60 inches horizontal separation	24 inches
Steam or Hot Water	60 inches horizontal separation	24 inches
Open Communications	24 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete
Secure Communications	36 inches horizontal separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.	24 inches vertical separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.
Electrical	12 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete

5.5.1.1 Connecting requirements for HDPE conduit running through and emerging from a bore

When placing HDPE conduit underground through a bore, use one continuous length of flexible HDPE conduit. In instances where a continuous run of conduit is not possible, individual sections shall be joined using heat-welded (fused) connections. After emerging from a bore, the HDPE will typically terminate in a manhole at both ends.

To join lengths of conduit together after emergence from a bore, follow these procedures:

a. If the emerging HDPE conduit is to be joined to PVC conduit, the HDPE conduit section shall be run into the bell end of the PVC conduit and cemented using a special bonding agent (Table III) (see Appendix F for a sample two-part bonding product). Adhesives typically used for connecting PVC segments are not of sufficient strength for HDPE-to-PVC transitions and shall not be used. Alternatively, the HDPE conduit may be connected to a PVC coupling on the end of a length of PVC conduit. The point of

transition shall then either be (1) encased in concrete together with the remaining run of PVC, or (2) direct earth buried, depending on the type of burial method used for the rest of the run.

b. Connection details involving HDPE conduit shall be shown on the drawings.

TABLE III. Adhesive minimum pullout-force requirements for bonding HDPE to HDPE and HDPE to PVC conduit materials.

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ⅛ inch	760 lb
1 ½ inch	2 ⅝ inch	1,140 lb
2 inch	2 ½ inch	1,520 lb
4 inch	3 ¾ inch	4,560 lb

5.5.2 Backfilling

Backfilling material and procedures depend on the design used, whether concrete-encased duct or direct buried conduit. Consult FAA Advisory Circular AC 150/5370-10 for construction details.

Trenches shall be completely backfilled and tamped level with the adjacent surface. When necessary to obtain the desired compaction, backfill material shall be moistened or aerated. When sod is to be placed over a trench, backfill shall be stopped at a depth equal to the thickness of the sod to be used. Excess excavated material shall be removed in accordance with the contract documents.

5.5.3 Restoration

Restoration shall be in accordance with local airport authority requirements, or as otherwise stated in the contract statement of work. Where it has been removed, soil shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable laying, pad construction, and other work shall be restored to the original condition.

Restoration shall include the necessary grading, seeding, sodding, sprigging, or hydroseeding as required to restore the disturbed area to match the adjacent area. Where trenching cuts through paved areas, the surface shall be properly backfilled and resurfaced with paving similar to the original paving or concrete as the drawings specify.

Resurfaced areas shall be level with original paving, free from cracks, and capable of withstanding full traffic loads without settling or cracking. The contractor shall be held responsible for maintaining all disturbed and restored surfaces until final acceptance by the FAA.

Directional bores shall be a minimum 48" below the existing base. For this project, the existing pavement shall be considered 12" in depth and the existing base shall be considered 12" in depth. Therefore, the overall depth shall be a minimum 72" below the surface of the pavement. The Contractor shall utilize a beacon or other depth reading instrument to verify the depth below the runway.

The bore size shall be the minimum size for the work required. Upsizing the bore will not be allowed.

The Contractor shall utilize a walkover guidance and tracking system to assure the orientation and depth of the bore path. Depth and orientation confirmation shall occur at a minimum of every five feet of lateral distance covered.

The Contractor shall perform all excavation required to complete the work regardless of the material encountered. Excavation from the access shafts (bore pits) in excess of the required to backfill the access shafts and open ditch portion of the line shall be disposed of by the Contractor off of Airport Property.

Pits and trenches shall be constructed and maintained in accordance with the current edition of the OSHA Standard for Excavating and Trench Safety Systems. Restore ground to original conditions after work completion including seeding and topsoiling.

The access shafts (bore pits) for encasement installation shall be rectangular in plan view with the longest dimension being constructed with the direction of the pipe. The access shafts shall be constructed at a location shown on the plans.

Use a high quality drilling fluid to ensure hole stability, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Use only fluid with a composition which complies with all federal, state and local environmental regulations. Mix the drilling fluid with potable water (of proper pH) to ensure no contamination is introduced into the soil during the drilling, reaming, or pipe installation process. The Contractor is responsible for any required pH adjustments.

Disposal of the drilling fluids is the responsibility of the Contractor. Conduct disposal in accordance with all relative environmental regulations and permit requirements. No excess drilling fluids shall remain in the bore access pit or receiving pit. Immediately clean up any drilling fluid spills or overflows from these pits. All excess drilling fluids and mud shall be disposed of off Airport Property on a daily basis. Bore pits and trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Assemble the entire pipe to be installed via directional boring prior to starting pull back operations. Support the pipe to enable it to move freely and prevent damage. Install the pipe in one continuous pull. Maximum allowable tensile force imposed on the pull section is not to exceed 90 percent of the pipe manufacturer's safe pull strength. If multiple pipe sizes or materials, the lowest safe strength shall govern. Damaged pipes shall be replaced at no additional cost to the Owner.

Extend and connect pipes to junction structures as indicated. When pipe is used as a sleeve, install interior conduits as indicated and terminate the conduits with end bells as shown in the plans or as required.

Upon completion of the work, immediately remove all debris from the job site and restore the areas to original condition acceptable to the Engineer.

The Contractor shall record and document drilling logs that provide drill bit locations, both horizontally and vertically. These records shall be submitted to the Engineer and included in the O&M manual for the project.

All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

METHOD OF MEASUREMENT

305-4.1 The quantity of directional boring to be paid for under this item shall be the number of linear feet of conduit and directional boring installed with backfill, compaction, turf restoration, and appurtenances, measured in place, completed and accepted to the satisfaction of the Engineer.

BASIS OF PAYMENT

305-5.1 Payment will be made at the contract unit price per linear foot for each type and size of directional boring completed by the Contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-305-5.1	Directional Boring, 2-Way 2"C Polyethylene Conduits – per Linear Foot

END OF ITEM SS-305

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ITEM SS-310 AIRPORT LIGHTING SYSTEMS

DESCRIPTION

310-1.1 This item shall consist of furnishing and installing airport runway and taxiway edge lighting systems, retroreflective markers, guidance signs, runway centerline and touchdown zone lighting systems, other taxiway lighting systems, and other approach lighting aid systems, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The system shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. This work shall include the furnishing of all equipment, materials, services and incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

310-1.2 Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

310-1.3 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

EQUIPMENT AND MATERIALS

310-2.1 GENERAL.

a. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

b. For pre-cast or prefabricated concrete encased light base installations, the Contractor shall submit and coordinate the construction of the proposed pre-cast units with the Engineer onsite to review and approve the construction process. The Contractor shall submit his proposed installation process for review and approval by the Engineer. The Contractor shall provide additional items and work if required and requested by the Engineer for the construction and installation of the pre-cast units at no additional cost to the Owner.

Pre-cast or prefabricated concrete encased light bases may only be assembled at the Contactor's staging area at the airport in order to allow the Engineer to check and approve all such construction items. Pre-cast bases assembled offsite will not be allowed.

c. For In-pavement fixture installations, the Contractor shall submit his proposed installation method and technique for correct placement and alignment of all lights for review and approval prior to any work.

In-pavement lighting systems will require an experienced electrical supervisor and experienced installation team, including licensed surveyor. This includes the complete installation, layout, and coordination with paving joints and paving work.

310-2.2 LIGHT FIXTURES. Airfield lights shall be supplied with all features and accessories including isolation transformers, light bases, base covers, safety ground rods, concrete pads and incidentals required for a complete installation as defined in these Specifications and as shown on the plans.

a. Medium Intensity Taxiway Lights (MITL):

(1) Taxiway edge elevated lights shall be L-861T(L), LED lamp, omnidirectional blue lens.

(2) Taxiway edge in-pavement lights shall be L-852T(L), LED lamp, Class 2, Style 3

(low profile), omnidirectional blue lens, mounted on a 12" diameter L-868B light base.

310-2.3 LAMPS. Lamps for elevated edge lights shall be LED type as specified.

310-2.4 SPARE EQUIPMENT INCLUDING LAMPS, FIXTURES, AND SPARE SIGN REPLACEMENT COMPONENTS. Provide 10 percent spare lamps of each type installed for lights and signs, minimum quantity of 6 required. Spare lamps shall not be measured for separate payment but shall be considered subsidiary to the light fixture and guidance sign pay items.

Provide 10 percent spare fixtures of each type installed for lights. Provide 10 percent spare sign replacement components of each type installed for signs. Spare fixtures and spare sign replacement components shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

Provide the following spare fixtures:

- 8 L-861T Taxiway Edge Lights
- 1 L-852T Taxiway Edge Light
- 1 set of spare replacement components for a 2-Module, Size 2 L-858 guidance sign
- 1 set of spare replacement components for a 3-Module, Size 2 L-858 guidance sign

a. A spare elevated LED fixture unit shall be one complete, ready-to-install fixture, including the coupling, column, head housing assembly, cordset, LED power supply assembly, LED assembly, and lens assembly.

b. A spare in-pavement LED fixture unit shall be one complete, ready-to-install fixture, including the top cover assembly, bottom pan assembly, cordset, LED power supply assembly, and LED assembly.

c. A spare sign replacement component unit shall include the LED light tube assembly and LED power supply assembly.

The spare lamps, spare fixtures and spare sign replacement components shall be delivered and stored as directed by the Owner, with transmittal receipt signed by Owner's representative. A signed copy shall be forwarded to the Engineer with an additional signed copy placed in the O&M manuals.

310-2.5 GUIDANCE SIGNS. Guidance signs shall be L-858(L), meeting the criteria set forth in AC 150/5345-44, Specification for Taxiway and Runway Signs, and suitable for base mounting. Each unit shall be furnished with the required panels, mounting assemblies, frangible couplings, transformer, intensity control, identification tag, metal tethers, fasteners and safety ground rods.

Style 2 and Style 3 signs shall meet the luminance requirements in AC 150/5345-44 throughout the current ranges of the associated series circuit.

Guidance signs shall have an integral on/off switch for airport maintenance use.

Signs shall be furnished with permanent type nameplates that are both weather and sunlight resistant. Nameplates which are completed with ink markers or similar methods will not be accepted.

Refer to the guidance sign index in the Plans for information on each sign's size, style, class and mode.

The complete sign installation shall be designed to withstand a 200-mph wind load.

Guidance signs shall be Size 2 (15" Legend), Style 2 (3-step circuit), Class 1 (operation range from -4 degrees F to 131 degrees F), Mode 2 (withstand wind loads of 200 mph).

310-2.6 ISOLATION TRANSFORMERS. New isolation transformers shall be Type L-830 and have a

wattage rating suitable for the wattage of the fixture and sign lamps. The transformer shall be listed in FAA Circular AC 150/5345-47.

Provide 10 percent spare isolation transformers of each type installed for lights, signs and other equipment. Spare transformers shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

310-2.7 FIELD LIGHTNING ARRESTOR. New series circuit field lightning arrestors shall be installed on the airfield series circuits to reduce the risk of lightning damage to the circuits, including cables, isolation transformers and field/vault lighting equipment. The arrestor assembly shall consist of a NEMA 6P rated metal enclosure, using MOV components, rated for 5,000 volts continuous operating voltage with 25,000 A peak surge current, having a minimum 2 giga-ohm insulation resistance, with L-823 connectors, The arrestors shall be designed specifically for protecting 5 kV airfield series circuits and shall be manufactured by ADB, Astronics or Liberty Airport Systems.

Provide 10 percent spare lightning arrestor units, minimum quantity of 2. Spare arrestors shall not be measured for separate payment but shall be considered subsidiary to the respective arrestor pay items.

CONSTRUCTION METHODS

310-3.1 GENERAL. The installation and testing details for the lighting system shall be as specified in the applicable advisory circulars.

The Contractor is responsible for all surveying and measurement which is required to accurately position and aim airfield lighting systems and equipment.

Airfield lighting systems and equipment that are improperly installed shall be removed and re-installed correctly as directed by the Engineer. No payment will be made for the removal and reinstallation of airfield lighting systems and equipment improperly installed. All remedial work shall be to the satisfaction of the Engineer.

310-3.2 LIGHTING LAYOUT PLANS. The Contractor shall stake the airfield lighting systems, prior to installation of any trench, cable or lighting apparatus. The intent is to stake the installation at the locations indicated, noting any deviation from plan dimensions to the Engineer prior to installation. The Contractor shall obtain the services of an experienced and licensed surveyor to perform this work.

The Engineer shall provide electronic CADD files to the Contractor for this staking work. The Contractor shall stake the items and his surveyor shall provide a CADD file submittal back to the Engineer. Based upon this submittal, the Engineer shall coordinate and provide directions on any adjustments necessary to meet existing field condition requirements and comply with FAA Advisory Circular requirements on the layout and spacing of equipment.

The Contractor and his surveyor shall then make any electronic CADD file spacing adjustments and/or field staking adjustments prior to installation at no additional cost to the Owner.

Refer to General Provisions Section 50 Control of Work for additional construction layout and staking requirements.

310-3.3 PLACING THE EQUIPMENT. The equipment shall be mounted on concrete pads as shown in the plans. Secure the equipment and make all final connections.

310-3.4 MOUNTING, LEVELING, AND AIMING. The concrete support to which the equipment is fastened shall be accurately leveled before mounting the equipment. The units shall be properly aimed, as recommended by the manufacturer of the supplied equipment. This adjustment shall be accomplished using

factory-approved aiming devices and techniques.

310-3.5 PLACING LIGHTS. All equipment shall be installed at locations indicated in the plans. Lights shall be laid out by locating the two control points by station as indicated on the plans and measuring the indicated individual separation distances. Light bases shall be located within 1 inch +/- longitudinally and 0.5 inches +/- transversely of the location indicated unless deviation is approved by the Engineer. Excavation for installation of light bases shall be backfilled with at least 4 inches of granular leveling course, as approved by the Engineer. Fixture height shall be as indicated on the Drawings.

For pre-cast or prefabricated concrete encased light base installations, a leveling course of sand shall be placed in the bottom of the excavated hole, sufficient for accurately installing, leveling and placing the lights in accordance with the requirements in this specification and AC 150/5340-30. Concrete encased light bases shall be allowed to cure a minimum of 7 days prior to installation.

Utilize a bubble level device to level all light fixtures in the horizontal light plane during the day, and then check at night to ensure uniformity in light output.

Provide factory-approved alignment tools and aiming devices to properly level and align fixtures as required by the FAA Advisory Circulars and manufacturer's installation instructions. After all light fixture installations are completed and accepted by the Engineer, these alignment tools and aiming devices shall become property of the Owner and shall be delivered and stored as directed by the Owner.

310-3.6 PLACING SIGNS. All signs shall be installed at the approximate location indicated in the plans. The specific requirements for sign location are specified in AC 150/5340-18, Standards for Airport Sign Systems. Specific requirements of this AC are also shown on the Plans. Signs shall be located within 1 inch +/- longitudinally or 0.5 inches +/- transversely of the required location unless deviation is approved by the Engineer. The locations for the signs shall be staked by the Contractor and approved by the Engineer before installation begins.

Provide single module signs with one tether. Provide multiple module signs with a tether at both ends.

310-3.7 PLACING FIELD LIGHTNING ARRESTORS. All field lighting arrestors shall be installed at locations indicated in the plans, typically about every 2,000 feet around the series circuit. The arrestors shall be installed in base cans or handholes as noted on the plans. Provide a minimum #4 AWG copper ground wire to connect the arrestor ground lug to dedicated ground rod outside the base can or handhole on the pavement side of the equipment. This ground rod shall be connected to the counterpoise system using exothermic welds only. Provide a permanent type marker at each arrestor listing the date it was placed in service.

310-3.8 TRANSFORMER INSTALLATION. The transformer for base mounted fixtures shall be placed inside the base. The transformer for stake mounted fixtures shall be located uniformly as shown on the plans. The primary cable connections shall be made with L-823 connectors as described in item L-108 and have 3 feet of slack cable. The secondary leads connected to the lamp leads by means of a disconnecting plug and receptacle provided with the unit, and this joint shall not be taped. The secondary joint shall be fastened with a holding ring provided for this purpose.

310-3.9 UNIT ASSEMBLY. All electrical equipment, including edge lights, guidance signs and other visual aid units shall be assembled in accordance with the manufacturer's installation procedures. Anti-seize compound shall be used on all screws, nuts, and threads, including frangible coupling threads. If coated bolts are used (ceramic metallic/fluoropolymer coating), then do not apply anti-seize compound.

Provide and install all spacers, shims, and gaskets as required, and verify they are in place before installing the light fixture on the base.

Bolts and washers for new and existing bases shall be new. Do not reuse existing hardware. The minimum thread engagement into top flange of the base shall be 0.5 inches.

For in-pavement light fixtures, provide Nord-Lock NL 3/8 stainless steel 2 part locking washers or approved equal, as required by the manufacturer.

Coordinate recommended torque values with the light fixture manufacturer, light base can manufacturer, stainless steel bolts and hardware used, and exact anti-seize compound used, in order to prevent light base thread damage. Utilize a dial-type torque wrench for accuracy and to prevent over-tightening bolts. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall submit complete installation method shop drawings and calculations to determine the proper torque requirements for review and approval by the Engineer prior to any field removal or installation work for in-pavement light fixtures.

When installing new or existing light fixtures on existing bases, the following work shall be performed for the removal and reinstallation work:

a. Remove all bolts including any that are frozen or broken. If necessary, drill out and tap for new bolt. If the can threads are galled but usable, clean threads with a tap.
b. Remove the light, base plate, transformer, and any foreign object that may be inside the can.
c. Remove the old cable, mandrel the conduits, and shop-vacuum out the can clean.
d. Install the new cable, connectors, transformer, gasket, bolts, and other required appurtenances per the fixture type and its location in accordance with FAA Advisory Circular requirements and manufacturer's requirements.
e. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall obtain complete installation manuals for the new airfield lighting equipment and the existing equipment to be reinstalled prior to any removal or installation work. Copies of these manuals shall be maintained in 3-ring binders within the Contractor's onsite field office.

In-pavement light fixtures that are installed too high will require their complete removal and reinstallation at no additional cost to the Owner. In-pavement fixtures shall be provided with all spacers, shims, gaskets and other appurtenances for complete installations that comply with FAA Advisory Circular requirements and manufacturer's installation instructions. All assemblies and work shall be to the satisfaction of the Engineer.

310-3.10 IDENTIFICATION NUMBERS. An identifying number shall be assigned to each light and sign in accordance with the plans or as approved by the Engineer and Owner. This number shall be imprinted with reflective black with 1/2" letters on a non-corrosive metal disc 2" minimum diameter and attached to the pavement side of the fixture with a metal screw.

310-3.11 TEMPORARY AIRFIELD LIGHTING. Refer to the Airfield Lighting Phasing Plans and Details for additional requirements. Existing lighting circuits shall remain operational by use of temporary circuits. New lighting circuits shall also be connected and remain operational by use of temporary circuits. This item shall include all work to maintain the existing and new lighting circuits during construction and allow all taxiways and runways in operation to remain lighted, including that portion through the construction area, as indicated in the Phasing Plans and as directed by the Engineer.

The Contractor shall perform initial field work including location and verification of existing circuits and submit plans for the temporary airfield lighting required in each work phase, for review and approval by the Engineer and Owner, prior to starting work of that phase. This work shall include megger testing of circuits and circuit segments before and after installation and connection of jumpers.

The Contractor shall install couplings and other required fittings/appurtenances in conduit systems at last pavement joint within each phase for connecting to conduit systems in the next phase, or for connecting to existing conduit systems to remain.

310-3.12 TESTING. The installation shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings as outlined in Item SS-300 and Item L-108. Testing equipment shall be furnished by the Contractor. Refer to Item L-108 for additional test requirements.

Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction.

All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

METHOD OF MEASUREMENT

310-4.1 The quantity of lights of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, base plates, gaskets, couplings, specified height columns, concrete bases, cables, connectors, safety ground rods, bolts/hardware, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare fixture requirements.

310-4.2 The quantity of guidance signs of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, concrete bases/pads, cables, connectors, safety ground rods, tethers, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare sign component requirements.

310-4.3 The quantity of field lightning arrestors, complete with arrestor, base, connectors, equipment safety ground rod, lightning arrestor ground rod, conductors, and all other required appurtenances, to be measured under this item shall be the number of each type installed, as completed units in place, ready for operation, and accepted by the Engineer.

310-4.4 Temporary airfield lighting shall be measured as a lump sum complete item per each respective phase work area, including all work completed in place and ready for operation, and including the installation, protection, and removal of all temporary cables, conduits, lighting, grounding, marking, and associated items and appurtenances, as indicated in the Drawings and as directed by the Engineer.

BASIS OF PAYMENT

310-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-310-5.1	L-858(L) Base Mounted, 2-Module Guidance Sign, Installed – per Each
Item SS-310-5.2	L-858(L) Base Mounted, 3-Module Guidance Sign, Installed – per Each
Item SS-310-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed – per Each
Item SS-310-5.4	L-852T(L) Low Profile Base Mounted In-pavement Taxiway Edge Light, Installed in Existing Pavement – per Each
Item SS-310-5.5	Field Lightning Arrestor, Installed – per Each
Item SS-310-5.6	Vehicle Sign Assembly, Installed – per Lump Sum

END OF ITEM SS-310

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ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. All reinforced concrete pipe shall be Class III pipe unless otherwise denoted on the plans. No pick-eye holes will be allowed.

701-2.2 PIPE. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 JOINT FILLERS. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets.

CONSTRUCTION METHODS

701-3.1 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical. *If subsurface conditions require, provide dewatering to carry out the work.*

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 BEDDING. The pipe bedding shall conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. Rigid Pipe. Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than *50%* ~~30%~~ of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least *50%*~~10%~~ of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be *number 57 stone as defined in ASTM C 33 or approved equal.* ~~sand or select sandy soil with 100% passing a 3/8 inch sieve and not more than 10% passing a No. 200 sieve.~~

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth	Minimum Bedding Depth
inch	inch
1/2	1
1	2
2	3
2-1/2	3-1/2

c. PVC, Polyethylene, and Polypropylene Pipe. For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 JOINING PIPE. Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal Pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, and Polypropylene Pipe. Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

701-3.5 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing *or* shall meet the requirements of Item P-153 *when called for in the Plans*. It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2 inch sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.

For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

When called for in the Plans, remove existing stormwater pipe by excavating, removing pipe, disposing of pipe in a manner consistent with local law and codes, and backfill of the excavation following Item P-152.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

***701-4.2** The length of pipe removed shall be measured in linear feet of pipe removed, backfilled, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, prior to removal, whichever is applicable.*

~~**701-4.2** The volume of concrete for pipe cradles shall be the number of cubic yards of concrete that is completed in place and accepted.~~

~~***701-4.2** The pipe end sections shall be measured for each complete unit installed in place, completed, and approved. Several classes, types and size shall be measured separately. All fittings and curtain walls shall be included as part of the item*~~

~~**701-4.3** The volume of rock shall be the number of cubic yards of rock excavated. No payment shall be made for the cushion material placed for the bed of the pipe.~~

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated; *and shall include all costs for excavation, dewatering, bedding, backfill and all other miscellaneous costs for installation of the pipe.* ~~at the contract unit price per cubic yard (cubic meter) of concrete for pipe cradles; and at the contract unit price per cubic yard for rock excavation.~~

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

***701-5.2** Payment will be made at the contract unit price per linear foot for removal of pipe of the type and size designated; and shall include all costs for excavation, dewatering, removal and disposal, backfill and all other miscellaneous costs for removal of the pipe.*

Payment will be made under:

Item D-701-1	18" Reinforced Concrete Pipe (Class III) – per Linear Foot

MATERIAL REQUIREMENTS

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains

ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

END ITEM D-701

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ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 BRICK. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 MORTAR. Mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole.

751-2.5 CORRUGATED METAL. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

a. ASTM A48	Gray iron castings
b. ASTM A47	Malleable iron castings
c. ASTM A27	Steel castings
d. ASTM A283	Grade D: Structural steel for grates and frames
e. ASTM A536	Grade 65-45-12: Ductile iron castings
f. ASTM A897	Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 STEPS. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

751-2.8 PRECAST INLET STRUCTURES. Manufactured in accordance with and conforming to ASTM C1433.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. *If subsurface conditions require, provide dewatering to carry out the work.* The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturb and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 BRICK STRUCTURES.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and Cold Weather Protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches . When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 CORRUGATED METAL STRUCTURES. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 INSTALLATION OF STEPS. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.9 BACKFILLING.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the Engineer. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit, completed and accepted.

751-4.2 Reinforcing steel shall not be measured for separate payment but shall be considered subsidiary to the structure in which it is contained.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; *dewatering*; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-1	4'X4' Single Grate Inlet (Heavy-Duty) - per Each
Item D-751-2	4'X4' Junction Box - per Each

MATERIAL REQUIREMENTS

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

END OF ITEM D-751

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ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

101-1.2 Limits of pavement removal, pavement repair, joint and crack repair, paint and rubber removal, and cold planing are estimated in the plans. Actual limits of these items shall be coordinated with the Engineer prior to construction.

EQUIPMENT

101-2.1 All equipment shall be specified hereinafter or as approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 REMOVAL OF EXISTING PAVEMENT

a. Concrete Pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab, or all multi-layer slabs, 1 foot inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be sawcut the full depth of the pavement. The pavement inside the sawcut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

b. Asphalt Concrete Pavement. Asphalt concrete pavement to be removed shall be cut to the full depth to existing subgrade or soil around the perimeter of the area to be removed. This includes asphalt surfacing, underlying pavement courses, and aggregate base down to top of subgrade or soil. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. If the material is to be wasted on the airport site, it shall be broken to a maximum size as designated by the airport owner.

c. Disposal. All existing pavement removed shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its costs shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.

101-3.2 PREPARATION OF JOINTS AND CRACKS. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks, ignoring hairline cracks (<

1/4 inch wide) with a crack sealant per ASTM D6690. Cracks and joints wider than 1/4 inch and less than 1/2 inch shall be filled with a hot-poured joint sealing conforming to ASTM D 6690. Wider cracks (over 1-1/2 inch wide) along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled within 0 to 1/8 inches (0-3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

a. Soil Sterilants. Soil sterilants shall contain Bromacil or Prometone and shall be approved by the Engineer. Application rates shall be in accordance with the manufacturer's recommendations.

b. Crack Preparation. A high temperature compressed air lance shall be used at all times to blast out any vegetation, dirt, dampness and loose materials from the cracks. Existing crack sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. After cleaning of crack, tack coat shall be applied prior to the application of emulsified asphalt and aggregate.

c. Filler Application. After cracks have been cleaned, received soil sterilant and tack coat, and have been approved by the Engineer, the cracks shall be filled with the emulsified asphalt and aggregate described within this specification. The mix shall be raked in the crack by hand in order to completely fill the entire crack. Once the crack is filled, excess asphalt mix shall be rounded up along the length of the crack, and pinched into the crack using a small asphalt roller. The application and compaction method shall be approved by the Engineer prior to beginning crack cleaning operations.

~~**101-3.3 REMOVAL OF PAINT AND RUBBER.** All paint and rubber over one foot wide that will affect the bond of the new overlay shall be removed from the surface of the existing pavement. Chemicals, high-pressure water, heater scarifier (asphaltic concrete only), cold milling, or sandblasting may be used. Any methods used shall not cause major damage to the pavement. Major damage is defined as changing the properties of the pavement or removing pavement over 1/8 inch deep. If chemicals are used, they shall~~

comply with the state's environmental protection regulations. No material shall be deposited on the runway shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 CONCRETE SPALL OR FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.

a. Repair of Concrete Spalls in Areas to be Overlaid with Asphalt. The Contractors shall repair all spalled concrete as shown on the plans or as directed by the Engineer. The perimeter of the repair shall be sawcut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphaltic concrete with a minimum Marshall stability of 1,200 lbs. and maximum flow of 20 (units of 0.01 in). The material shall be compacted with equipment approved by the Engineer until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphaltic Concrete Pavement Repair. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. The base course and subbase shall be replaced if it has been infiltrated with clay, silt, or other material affecting the load-bearing capacity. Materials and methods of construction shall comply with the other applicable sections of this specification.

101-3.5 COLD MILLING. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a finished surface that provides a good bond to the new overlay. The milling machine or grinder shall operate without tearing or gouging the under laying surface. The milling machine or grinder shall be equipped with automatic grade and slope controls. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material that was removed with new material at no additional cost to the Owner.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Contractor Engineer shall layout the area to be milled with a straightedge in increments of 1 foot widths. The Contractor's layout shall be approved by the Engineer prior to beginning milling operations. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, Grade Correction, or Surface Correction. The milling machine shall have a minimum width of [7] feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade and tolerances specified. The machine shall cut vertical edges. A positive method of dust control shall be provided. The machine shall have the ability to windrow the millings or cuttingsor remove the millings or cuttings from the pavement and load them into a truck.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove any remaining aggregate or fines.

101-3.6 PREPARATION OF ASPHALT PAVEMENT SURFACES. Existing asphalt pavements indicated to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt concrete similar to that of the existing pavement in accordance with paragraph 101-3.4.

~~b. Repair joints and cracks in accordance with paragraph 101-3.2.~~

~~c. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.~~

~~d. Clean pavement surface immediately prior to placing the surface treatment by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.~~

101-3.7 MAINTENANCE. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 PREPARATION OF JOINTS IN RIGID PAVEMENT.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning Prior to Sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than three inches from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

~~**101-3.9 PREPARATION OF CRACKS IN FLEXIBLE PAVEMENT.**~~

~~**101-3.9.1 Preparation of Crack.** Widen crack with router random crack saw by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, joints will be blown out with a hot air lance combined with oil and water-free compressed air.~~

~~**101-3.9.2 Removal of Existing Sealant.** Existing sealants will be removed by routing random crack saw. Following routing sawing any remaining debris will be removed by use of a hot lance combined with oil and water free compressed air.~~

METHOD OF MEASUREMENT

101-4.1 PAVEMENT REMOVAL. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor, *regardless of the thickness or composition. Asphalt milling shall be measured by the square yard milled, regardless of thickness.* Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

~~**101-4.2 JOINT AND CRACK REPAIR.** The unit of measurement for joint and crack repair shall be the linear foot of joint.~~

~~**101-4.3 PAINT AND RUBBER REMOVAL.** The unit of measurement for paint and rubber removal shall be the square foot.~~

~~**101-4.4 SPALLED AND FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.**~~

~~a. The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the Engineer and the Contractor.~~

~~b. The unit of measure for failed asphaltic concrete pavement shall be square feet.~~

~~**101-4.5 COLD MILLING.** The unit of measure for cold milling shall be [___] inches of milling per square yard. The location and average depth of the cold milling shall be determined and agreed to by the Engineer and the Contractor prior to beginning the work. If the initial cut doesn't correct the condition and surface correction is required, the Contractor shall re-mill the area and will be paid only once for the total depth of milling.~~

BASIS OF PAYMENT

101-5.1 PAYMENT. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-1	Concrete Pavement Removal - per Square Yard
Item P-101-2	Milling and Removal of Asphalt Pavement Surfacing (4" thickness) - per Square Yard

MATERIAL REQUIREMENTS

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

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ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions*. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective Grading. When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3~~. *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation.** The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* will be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557.** The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of 2 coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.~~ ~~[The quantity of compacted embankment in place to be paid for shall be the number of cubic yards measured in its final position.~~

Measurement of excavation/embankment shall be based on ***plan quantities****. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards measured in its original position at the borrow pit.

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D 4318.

154-2.2 SAMPLING AND TESTING. Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

154-3.2 OPERATION IN PITS. The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform

and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

154-3.3 PREPARING UNDERLYING COURSE. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources will be blended and mixed, the subbase material shall be processed in a central or travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers of not less than 3 inches nor more than 8 inches of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory

specimens shall be compacted and tested in accordance with **ASTM D1557, determined by the Contractor in the presence of the Engineer**. The in-place field density shall be determined in accordance with **ASTM D 6938 using Procedure A, the direct transmission method, and ASTM D 6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D 6938**. The moisture content of the material at the start of compaction shall be within ±2% of the optimum moisture content. All testing shall be done by **the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.**

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8 inch when tested with a 12 feet straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

154-3.8 SURFACE TOLERANCE. The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12-foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

154-3.9 THICKNESS CONTROL. The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown. ***There will be no separate payment for additional thickness.*** The thickness of the completed subbase course shall be determined by **depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards.**

154-3.10 PROTECTION. Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

154-3.11 MAINTENANCE. The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of **square yards at the thickness indicated on the PLANS** of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon **depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard of subbase course**. On individual depth measurements, thicknesses more than 1/2 inch in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per square yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-1	8" Subbase Course - per Square Yard

TESTING REQUIREMENTS

ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-154

ITEM P-155 LIME-TREATED SUBGRADE

DESCRIPTION

155-1.1 This item shall be used for soil modification to achieve specific needs that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans. ***Dry placing of lime shall not be used. Slurry placement of lime will be the only acceptable method of placement.***

MATERIALS

155-2.1 LIME. Quicklime and hydrated lime, either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone shall not be permitted.

155-2.2 COMMERCIAL LIME SLURRY. Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

a. **Chemical Composition.** The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.

b. **Residue.** The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve = maximum 0.0%
Residue retained on a No. 10 sieve = maximum 1.0%
Residue retained on a No. 30 sieve = maximum 2.5%

c . **Grade.** Commercial lime slurry shall conform to one of the following two grades:

Grade 1 – The "dry solids content" shall be at least 31% by weight, of the slurry.

Grade 2 -- The "dry solids content" shall be at least 35%, by weight, of the slurry.

d. Submittals. *The Contractor shall submit to the Engineer certified test results or manufacturer's certification on the quicklime or lime slurry mix to be used before construction. No work shall begin nor shall any lime or lime slurry be placed for payment until the Contractor has submitted samples of the materials intended for use and the materials have been approved by the Engineer.*

155-2.3 WATER. Water used for mixing or curing shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

155-2.4 SOIL. The soil for this work shall consist of inorganic natural materials on the site or selected materials from other sources; uniform in quality and gradation; and shall be approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches.

COMPOSITION

155-3.1 SOIL-LIME MIXTURE. Lime shall be applied at the rate specified on the plans for the depth of subgrade treatment shown.
155-3.2 TOLERANCES. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Lime	+ 0.5%
Water	+ 2%, -0%

WEATHER LIMITATIONS

155-4.1 WEATHER LIMITATION. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply lime unless the air temperature is at least 40°F and rising. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35°F, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.

Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 EQUIPMENT. The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the lime or lime slurry, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

CONSTRUCTION METHODS

155-6.1 GENERAL. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent courses. The Contractor shall be responsible to meet the above requirements.

Before beginning lime treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. The machine must give visible indication at all times that it is cutting the material uniformly to the proper depth over the entire width of the cut.

If a cutting and pulverizing machine is not used, the material to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. The excavated material shall then be spread to the desired cross-section and uniformly mixed and compacted.

155-6.2 APPLICATION. Lime shall be spread only over an area where the initial mixing operations can be completed during the same work day. The application and mixing of lime with the soil shall be accomplished by the methods described as "Dry Placing" or "Slurry Placing." The Contractor may use either method when hydrated lime is specified.

~~a. Dry Placing. The lime shall be spread uniformly over the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as specified on the plans. The material shall be sprinkled until the specified moisture content has been reached.~~

~~The lime shall be distributed in a manner that will minimize scattering by wind. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to proper application. A motor grader shall not be used to spread the lime.~~

b. Slurry Placing. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry. Commercial lime slurry shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime shall be by successive passes over a measured section of subgrade until the specified amount of lime has been spread. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as shown on the plans. The distributor truck shall continually agitate the slurry to keep the mixture uniform.

155-6.3 MIXING. The mixing procedure shall be the same for "Dry Placing" or "Slurry Placing" as hereinafter described:

a. Preliminary Mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 5% above the optimum moisture of the material and to ensure chemical action of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 48 hours or until the material becomes friable. During the curing period, the material shall be sprinkled as directed by the Engineer.

b. Final Mixing. After the required curing time, the material shall be uniformly mixed by approved methods. If the mixture contains clods, they shall be reduced in size by blading, discing, harrowing, scarifying, or the use of other approved pulverization methods so that the remainder of the clods shall meet the following requirements when tested dry by laboratory sieves. After curing, pulverize lime treated material until soil particles pass a one inch sieve and 60% pass the No. 4 sieve. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 COMPACTION. Compaction of the mixture shall immediately follow the final mixing operation with no part of the mixture uncompacted more than 30 minutes after final mixing. The material shall be aerated or sprinkled as necessary to provide the optimum moisture content during compaction. The field density of the compacted mixture shall be at least 93% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested *by the Contractor* in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in- place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. Testing frequency shall be a minimum of one compaction test per **500** square yards of stabilized base or as directed by the Engineer.

The material shall be sprinkled and rolled as directed by the Engineer. All irregularities, depressions, or weak spots that develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the subgrade shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed on it or the work is accepted by the Engineer.

The full depth of the material shown on the plans shall be compacted to remain firm and stable under construction equipment. All *in-place* testing shall be done by the Engineer. Perform in-place density test

to determine degree of compaction between 24 and 72 hours after final compaction and 24 hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. The shape of the course shall be maintained smooth and shall conform to the typical section shown on the plans and the established lines and grades. If the material loses the specified stability, density, and finish before the next course is placed or the work is accepted by the Engineer, the material shall be recompacted and refinished by the Contractor, and the cost shall be incidental to this item.

155-6.5 FINISHING AND CURING. After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch when tested with a 12 feet straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.

The completed section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer. Subsequent courses shall be applied within 14 days after the lime-treated subgrade is cured.

155-6.6 THICKNESS. The thickness of the final lime-treated subgrade shall be not less than the thickness specified. Thickness shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 300 square yards. When the base deficiency is more than 1/2 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace the base material where borings are taken for test purposes. This cost shall be incidental to this item.

155-6.7 MAINTENANCE. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

155-6.8 HANDLING AND SAFETY. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work.

155-7.2 Lime shall be paid by the number of tons of Hydrated Lime, or the calculated equivalent, used in the completed and accepted work. "Calculated Equivalent" will be determined by the Engineer as follows:

a. Hydrated lime delivered to the project in dry form will be measured according to the actual tonnage either spread on the subgrade or batched on site into a slurry, whichever is applicable.

b. Lime delivered to the project in slurry form will be paid for on the basis of certified chemical composition tickets and batch weight tickets. The Owner shall reserve the right to have the dry lime content verified by an independent testing laboratory. If the chemical composition is reported on the basis of Pebble Quicklime, the equivalent hydrated lime will be determined in accordance with paragraph c. below.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade at the thickness specified. The price shall be full compensation for furnishing all material, except the lime,

and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

155-8.2 Payment shall be made at the contract unit price per pound of lime. This price shall be full compensation for furnishing, delivery, and placing this material.

Payment will be made under:

Item P-155-1	16" Lime-treated subgrade - per Square Yard
Item P-155-2	Lime - per Ton

TESTING REQUIREMENTS

ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

MATERIAL REQUIREMENTS

ASTM C 51	Standard Terminology Relating to Lime and Limestone (as used by the Industry)
ASTM C 977	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
ASTM D 3551	Standard Practice for Laboratory Preparation of Soil-Lime Mixtures Using Mechanical Mixer

END OF ITEM P-155

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ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be design, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

***156-1.2** This item covers the application of Temporary Erosion Control items at locations shown on the Plans, as directed by the Engineer, and as required for permit compliance, and the **requirement** of the Contractor to produce, execute, and maintain a specific Storm Water Pollution Prevention Plan (SWPPP) for the project. The Contractor will also be required to request and obtain all necessary federal, state, and local permits. The temporary erosion control measures shown in the Plans do **not** represent the extent of work and coordination required by the Contractor under this item.*

MATERIALS

156-2.1 GRASS. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

156-2.2 MULCHES. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per ItemT-908. Mulches shall not create a wildlife attractant.

156-2.3 FERTILIZER. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 SLOPE DRAINS. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 SILT FENCE. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461

156-2.6 OTHER. All other materials shall ~~meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project~~ *be in accordance with SECTION 506 – TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS of the Standard Specifications, except as modified or augmented herein. Heavy Duty silt fencing (with welded wire in the fabric) may be required on*

steep slopes if the Engineer determines that the silt fence used by the Contractor is not performing satisfactory.

CONSTRUCTION REQUIREMENTS

156-3.1 GENERAL. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

~~The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.~~

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 INSTALLATION, MAINTENANCE AND REMOVAL OF SILT FENCES. Silt fences shall extend a minimum of 16 inches and a maximum of 34 inches above the ground surface. Posts shall be set no more than 10 feet on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch overlap and securely sealed. A trench shall be excavated approximately 4 inches deep by 4 inches wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

156-3.5 CONSTRUCTION METHODS. *Providing the temporary erosion control items and devices shown on the Plans is intended to minimize the erosion of soils during construction. However, the items and devices shown are not intended to represent all of the necessary items or procedures required to be implemented by the Contractor. The plans and specifications show the Engineer's estimate of a minimum effort needed to maintain proper erosion control during construction. Additional effort and materials may be required by the Contractor to minimize the erosion of soils during construction. It shall be the Contractor's responsibility to install and maintain all the items shown in the Plans and to coordinate, submit, obtain, and comply with all necessary Federal, State, and local permits. The coordination with governing agencies shall include, but not limited to the following:*

- *Filing the Notice of Intent with TCEQ and paying any fee(s) required with the filing,*
- *Producing and maintaining an approved Storm Water Pollution Prevention Plan,*
- *Coordinating and obtaining all local permits regarding grading operations for the proposed improvements, Contractor's staging area, spoil placement and any other grading operations related to the project as directed by the local governing agency.*
- *Filing the Notice of Termination with TCEQ and paying any fee(s) required with the filing.*

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as *one complete item. This work includes obtaining all necessary federal, state, and local permits required to complete this project.* ~~follows:~~

~~a. Temporary seeding and mulching will be measured by the square yard.~~

~~b. Temporary slope drains will be measured by the linear foot.~~

~~c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard of excavation performed, including necessary cleaning of sediment basins, and the cubic yard of embankment placed as directed by the Engineer.~~

~~d. All fertilizing will be measured by the ton.~~

~~e. Installation and removal of silt fence will be measured by the [linear foot] [Lump sum].~~

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 *Temporary erosion control acceptably completed will be paid for at the contract lump sum price bid for "TEMPORARY EROSION CONTROL," which shall be full compensation for furnishing all materials, tools, equipment, labor, and incidentals necessary to complete the work. Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer. Payment for "TEMPORARY EROSION CONTROL" will also include obtaining and compliance with the SWPPP, which shall include compensation for drainage-way inspections, report preparation, housekeeping practices, cleaning and maintenance, and other actions outlined in the SWPPP prepared by the Contractor necessary to execute the Plan. This item consists of all erosion control items not listed as a separate pay item in the Unit Price Schedule. Any fines issued to the Owner as a result of the Contractor's insufficient execution of the SWPPP will be assessed to the Contractor. Such deductions shall not be limited to the lump sum price of this item.*

Payment will be made under:

Item P-156-1	*Temporary Erosion Control—per Lump Sum*

~~**156-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:~~

~~Item P-156-5.1a~~	~~Temporary seeding and mulching—per Square Yard.~~
~~Item P-156-5.1b~~	~~Temporary slope drains—per Linear Foot.~~
~~Item P-156-5.1c~~	~~Temporary benches, dikes, dams and sediment basins—per Cubic Yard~~
~~Item P-156-5.1d~~	~~Fertilizing—per Ton~~
~~Item P-156-5.1e~~	~~Installation and removal of silt fence [per Linear Feet] [Lump Sum]~~

~~Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.~~

~~Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.~~

MATERIAL REQUIREMENTS

ASTM D6461	Standard Specification for Silt Fence Materials
AC 150/5200-33	Hazardous Wildlife Attractants

END OF ITEM P-156

ITEM P-501 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 AGGREGATES.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine Aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than 0.075mm (No. 200 sieve)	ASTM C117	3.0

Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse Aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than one inch, the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40% when tested in accordance with ASTM C 131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve (9 mm) shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (0.075mm)	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.0)	1.0
Total of all deleterious Material		3.0

Table 1. Gradation for Coarse Aggregate (ASTM C33)

Sieve Designations (square openings)		Percentage by Weight Passing Sieves	
inch	mm	#4 1-1/2 inch – 3/4 inch	#57 1 inch – No. 4
2-1/2	60	---	---
2	50	100	---
1-1/2	38	90-100	100
1	25	20-55	95-100
3/4	19	0-15	---
1/2	13	---	25-60
3/8	9	0-5	---
No. 4	4.75	---	0-10
No. 8	2.36	---	0-5

(1) Aggregate susceptibility to Disintegration (D) Cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation CF = (cumulative percent retained on the 3/8 in. sieve)(100) / (cumulative percent retained on the No. 8 sieve)

(c) The Workability Factor WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF- 28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 CEMENT. Cement shall conform to the requirements of ASTM C 150 Type I.

If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

~~**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.~~

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 JOINT SEAL. The joint seal for the joints in the concrete pavement shall meet the requirements of **Item P-605** and shall be of the type specified in the plans.

501-2.5 ISOLATION JOINT FILLER. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1752, Type II or III and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Carbon-Steel Bars conforming to the requirements of ASTM A615.

501-2.7 DOWEL AND TIE BARS. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted.

Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 WATER. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 ADMIXTURES. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:

Constituent:	Limit (Percent by Mass):
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 EPOXY-RESIN. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1 GENERAL. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 PROPORTIONS. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of **650** psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **517** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall not be more than **0.45** by weight

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a slump for sideform concrete between 1 and 2 inches (25 mm and 50 mm) as determined by ASTM C143. At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at seven (7) and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted

to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.

b. Reactivity Test Results.

c. Coarse aggregate quality test results, including deleterious materials.

d. Fine aggregate quality test results, including deleterious materials.

e. Mill certificates for cement and supplemental cementitious materials.

f. Certified test results for all admixtures, including Lithium Nitrate if applicable.

g. Specified flexural strength, slump, and air content.

h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.

k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b.Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from

laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.4 ADMIXTURES.

a. Air-Entraining admixtures. Air-entraining admixture is to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 5.5%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 CONCRETE MIX DESIGN LABORATORY. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

CONSTRUCTION METHODS

501-4.1 EQUIPMENT. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch Plant and Equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and Transportation Equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Nonagitator trucks. Nonagitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing Equipment. The standard method of constructing concrete pavements may be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float- finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 lbs per foot of paving lane width and powered by an engine having at least 6.0 horsepower per foot of lane width.

On projects requiring less than 500 square yard of cement concrete pavement or requiring individual placement areas of less than 500 square yard, or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025- 0.05 inch.

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete Saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100-foot radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting

sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 FORM SETTING. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8 inch at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 CONDITIONING OF UNDERLYING SURFACE. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3 feet to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete.

The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 CONDITIONING OF UNDERLYING SURFACE, SIDE-FORM AND FILL-IN LANE CONSTRUCTION. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 HANDLING, MEASURING, AND BATCHING MATERIAL. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 MIXING CONCRETE. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators.

Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold Weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials

b. Hot Weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature Management Program. Prior to the start of paving operation for each day of paving, the contractor shall provide the engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

501-4.8 PLACING CONCRETE. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a **flexural strength of 550 psi, based** on the average of four field cured specimens per 2,000 cubic yards of concrete placed. Also, subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi.

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-Form Construction. The concrete shall be distributed uniformly into final position by a self- propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full

width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8000 to 12000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude shall vary proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500 foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

b. Side-Form Construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines.

These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than one foot from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6 to 15 inches on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire- brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 JOINTS. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2 inch from their designated position and shall be true to line with not more than 1/4 inch variation in 10 feet. The surface across the joints shall be tested with a 12 feet straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that

spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

d. Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

e. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer.

f. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

g. Placing dowels and tie bars. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8 inch per feet. Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of ±5/8 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch. The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6 inches to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum **flexural strength of 450 psi** before drilling commences. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of ±1/2 inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of Joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 FINISHING. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straight edge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8 inch of mortar-rich surface (defined as deficient in plus U.S. No. 4 (4.75 mm) sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be

used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least one foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike- off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straight-edge Testing and Surface Correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8

inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Burlap Drag Finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard (555 grams per square meter). To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16 inch in depth.

501-4.13 CURING. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 sq ft. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to

remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

~~c. Water Method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.~~

d. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

~~**501-4.15 SAW-CUT GROOVING.** If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

501-4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with **Item P-605.**

501-4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 OPENING TO TRAFFIC. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 lb / square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 REPAIR, REMOVAL, REPLACEMENT OF SLABS.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

b. Shrinkage Cracks. Shrinkage cracks, which do not exceed 4 inches in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4 inches in depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs With Cracks through Interior Areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches in depth, that extend into the interior area.

d. Cracks Close To and Parallel To Joints. All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6 inches either side of the joint shall be treated as specified here. Any crack extending more than 6 inches from the joint shall be treated as specified above in subparagraph c.

(1) Full Depth Cracks Present, Original Joint Not Opened. When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure

injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full Depth Cracks Present, Original Joint Also Cracked. At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.

e. Removal and Replacement of Full Slabs. Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars. These joints shall then be carefully sawed on the joint line to within one inch of the depth of the dowel or tie bar.

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment.

Care shall be taken to prevent damage to the dowels, tie bars, or to concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

f. Repairing Spalls Along Joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inch. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high-pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat of epoxy resin, Type III, Grade I, shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Pooling of epoxy resin shall be avoided. The cavity shall be filled with low slump Portland cement

concrete or mortar or with epoxy resin concrete or mortar. Concrete shall be used for larger spalls, generally those more than 1/2 cu. ft. in size, and mortar shall be used for the smaller ones. Any spall less than 0.1 cu. ft. shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Portland cement concrete and mortar mixtures shall be proportioned as directed and shall be mixed, placed, consolidated, and cured as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140°F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper one-eight (1/8th) inch of the pavement surface.

g. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch wide and there shall be a minimum of 55 to 60 blades per 12 inches of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The area corrected by diamond grinding the surface of the hardened concrete should not exceed 10% of the total area of any sublot. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, may require removing and replacing in conformance with paragraph 501-4.19.

501-4.20 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR.

All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface.

a. Removal of Existing Pavement Slab.

When it is necessary to remove existing concrete pavement and leave adjacent concrete in place, unless there are dowels present, the joint between the removal area and adjoining pavement to stay in place, including dowels or tie bars, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made full depth just beyond the end of dowels. The edge shall then be carefully sawed on the joint line to within one inch of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 12 inches from the end of any dowels. All pavement between this last saw cut and the joint line shall be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or the approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in

the pavement which is to remain in place. Where dowels are present, care shall be taken to produce an even, vertical joint face below the dowels. If the Contractor is unable to produce such a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501- 4.10g. All this shall be at no additional cost to the Owner.

Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any direction greater than 1/2 inches and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

b. Edge repair.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas that are damaged during construction shall be repaired at no cost to the Owner.

(1) Spall repair. Spalls shall be repaired where indicated and where directed by the Engineer. Repair materials and procedures shall be as previously specified in subparagraph 501-4.19f.

(2) Underbreak repair. All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompacted, without addition of any new material. Finally, the void shall be completely filled with paving concrete, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound.

(3) Underlying material. The underlying material adjacent to the edge and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient material shall be kept in place outside the joint line to prevent disturbance (or sloughing) of material under the pavement that is to remain in place. Any material under the portion of the concrete pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified in paragraph 501-4.20b(2). The underlying material outside the joint line shall be thoroughly compacted and moist when new concrete is placed.

MATERIAL ACCEPTANCE

501-5.1 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the Engineer at no cost to the Contractor. The Contractor shall bear the cost of providing curing facilities for the strength specimens, per paragraph 501-5.1a(3), and coring and filling operations, per paragraph 501-5.1b(1). Testing organizations performing these tests shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Concrete shall be accepted for strength and thickness on a lot basis

A lot shall consist of a day's production not to exceed **2,500 square yards.**

a. Flexural Strength.

(1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete shall be sampled in accordance with ASTM C172.

(2) Testing. Two (2) specimens shall be made from each sample. Specimens shall be made in accordance with ASTM C31 and the flexural strength of each specimen shall be determined in accordance with ASTM C78. The flexural strength for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

Immediately prior to testing for flexural strength, the beam shall be weighed and measured for determination of a sample unit weight. Measurements shall be made for each dimension; height, depth, and length, at the mid-point of the specimen and reported to the nearest 1/10 inch. The weight of the specimen shall be reported to the nearest 0.1 pound. The sample unit weight shall be calculated by dividing the sample weight by the calculated volume of the sample. This information shall be reported as companion information to the measured flexural strength for each specimen.

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method.

Slump, air content, and temperature tests will also be conducted by the quality assurance laboratory for each set of strength test samples, per ASTM C31.

(3) Curing. The Contractor shall provide adequate facilities for the initial curing of beams. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

(4) Acceptance. Acceptance of pavement for flexural strength will be determined by the Engineer in accordance with paragraph 501-5.2b.

b. Pavement Thickness.

(1) Sampling. Each lot shall be divided into four equal sublots and one core shall be taken by the Contractor for each sublot. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, shall be excluded from sample locations.

Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes shall be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores shall be determined by the Engineer by the average caliper measurement in accordance with ASTM C174.

(3) Acceptance. Acceptance of pavement for thickness shall be determined by the Engineer in accordance with paragraph 501-5.2c.

c. Partial Lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they shall constitute a lot. Where one or two sublots have been produced, they shall be incorporated into the next lot or the previous lot and the total number of sublots shall be used in the acceptance criteria calculation, that is, n=5 or n=6.

d. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the percentage of material within specification limits (PWL) shall be determined using the remaining test values.

501-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-5.2e:

(1) Flexural strength
(2) Thickness
(3) Smoothness
(4) Grade
(5) Edge slump

Flexural strength and thickness shall be evaluated for acceptance on a lot basis using the method of estimating PWL. Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L).

Acceptance for flexural strength will be based on the criteria contained in accordance with paragraph 501-5.2e(1). Acceptance for thickness will be based on the criteria contained in paragraph 501-5.2e(2). Acceptance for smoothness will be based on the criteria contained in paragraph 501-5.2e(3). Acceptance for grade will be based on the criteria contained in paragraph 501-5.2e(4).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Flexural Strength. Acceptance of each lot of in-place pavement for flexural strength shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

c. Pavement Thickness. Acceptance of each lot of in-place pavement shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

d. Percentage of Material Within Limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The lower specification tolerance limit (L) for flexural strength and thickness shall be:

Lower Specification Tolerance Limit (L)

Flexural Strength	0.93 x strength specified in paragraph 501-3.1
Thickness	Lot Plan Thickness in inches, - 0.50 in

e. **Acceptance Criteria.**

(1) Flexural Strength. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(3) Smoothness. As soon as the concrete has hardened sufficiently, but not later than 48 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each section of pavement having an average profile index meeting the requirements of paragraph 501-8.1c when evaluated with a profilograph; and the finished surface of the pavement shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. When the surface smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the pavement, full depth removal and replacement of pavement shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet or more often if directed by the Engineer. Maximum gap on final pavement surface > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the one third points of paving lanes when widths of paving lanes are 20 ft or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. Smoothness readings will not be made across grade changes or cross slope transitions, at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement surface > 1/4 inch in longitudinal direction will be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

~~**(ii) Profilograph Testing.** Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.~~

~~The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. Deviations on final surface in longitudinal direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.~~

~~Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches per mile or less. If the initial average profile index was less than 15 inches, only those areas representing greater than 0.4 inch deviation will be re-profiled for correction verification.~~

~~**(iii) Final profilograph of runway.** Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.~~

~~Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 48 hours of placement of material. Smoothness testing indicated in paragraph (iii) shall be performed within 48 hours final paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then~~

~~production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.~~

(4) Grade. An evaluation of the surface grade shall be made by the Engineer for compliance to the tolerances contained below. The finish grade will be determined by running levels at intervals of 50 ft or less longitudinally and all breaks in grade transversely (not to exceed 50 ft) to determine the elevation of the completed pavement. The Contractor shall pay the costs of surveying the level runs, and this work shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

(a) Lateral Deviation. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.

(b) Vertical Deviation. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.

(5) Edge Slump. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer in accordance with paragraph 501-4.8a.

f. Removal and Replacement of Concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 501-4.10 shall apply to all contraction joints exposed by concrete removal. Removal and replacement shall be in accordance with paragraph 501-4.20.

CONTRACTOR QUALITY CONTROL

501-6.1 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that effect the quality of the pavement including but not limited to:

a. Mix Design
b. Aggregate Gradation
c. Quality of Materials
d. Stockpile Management
e. Proportioning
f. Mixing and Transportation
g. Placing and Consolidation
h. Joints
i. Dowel Placement and Alignment
j. Flexural or Compressive Strength
k. Finishing and Curing
l. Surface Smoothness

501-6.2 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

a. Fine Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 70 or ASTM C 566.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 566.

c. Slump. Four slump tests shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air Content. Four air content tests, shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Four unit weight and yield tests shall be made in accordance with ASTM C 138. The samples shall be taken in accordance with ASTM C 172 and at the same time as the air content tests.

501-6.3 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, moisture content and air content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and Coarse Aggregate Gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in the Lower Specification Tolerance Limit (L) table above and the Control Chart Limits table below shall be superimposed on the Control Chart for job control.

b. Slump and Air Content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

CONTROL CHART LIMITS			
Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1 inch	+0.5 to -1.5 inch	± 1.5 inch
Air Content	±1.2%	± 1.8%	± 2.5%
Fixed Form			
Slump	+ 0.5 to -1 inch	+1 to -1.5 inch	± 1.5 inch
Air Content	± 1.2%	± 1.8%	± 2.5%

The individual measurement control charts shall use the mix design target values as indicators of central tendency.

501-6.4 CORRECTIVE ACTION. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of control. The Contractor Quality Control Program shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and Coarse Aggregate Gradation. When two consecutive averages of five tests are outside of the specification limits in paragraph 501-2.1, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Fine and Coarse Aggregate Moisture Content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

c. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

d. Air Content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

METHOD OF MEASUREMENT

501-7.1 Portland cement concrete pavement shall be measured by the number of **square yards** of either plain or reinforced pavement as specified in-place, completed and accepted.

The Contractor's Quality Control Plan shall not be measured separately but shall be considered an incidental aspect of the pavement construction.

BASIS OF PAYMENT

501-8.1 PAYMENT. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-5.2 Acceptance Criteria shall be based on results of smoothness, strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness and 501-8.1c for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed **100 percent** of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both flexural strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both flexural strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either flexural strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both flexural strength and thickness are less than 100%.

PRICE ADJUSTMENT SCHEDULE [1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment limitation shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%.

b. Payment. Payment shall be made under:

Item P-501-1 12.5" Portland Cement Concrete Pavement—per square yard

c. Basis of adjusted payment for Smoothness. Price adjustment for pavement smoothness will apply to the total area of concrete within a section of pavement and shall be applied in accordance the following equation and schedule:

(Square yard in section) × (original unit price per square yard) × PFm = reduction in payment for area within section

Average Profile Index (Inches Per Mile) Pavement Strength Rating			Contract Unit Price Adjustment (PFm)
Over 30,000 lb	30,000 lb or Less	Short Sections	
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	0.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 and up	15.1 and up	22.1 and up	Corrective work required

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing With Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662 Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A714	Standard Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving And Structural Construction
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
AC 150/5320-6	Airport Pavement Design and Evaluation
PCA	Design and Control of Concrete Mixtures

END ITEM P-501

ITEM P-605 JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

This item shall also consist of the cleaning and sealing of cracks and joints in existing concrete pavement, at the locations shown in the plans or as directed by the Engineer. The amount of crack filling/sealing designated in the Plans is estimated.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealant materials shall meet the requirements of **ASTM D 5893, Type SL Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.**

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 BACKER ROD. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the ~~crack~~ joint.

605-2.3 BACKUP MATERIALS. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.4 BOND BREAKING TAPES. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.5 HERBICIDES. *Submit documentation on all herbicides to be used in the preparation of the joint replacement. Include in submittal proposed application rates in accordance with Texas Department of Agriculture regulations.*

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

Prior to beginning the sealing operation, the Contractor shall have the sealant supplier demonstrate, to the satisfaction of the Engineer, the cleaning and installation procedures for the joint sealant to be installed on the project.

If the pavement must be opened to traffic prior to placement of the sealant, Contractor to temporarily fill the joint with a jute or nylon rope immediately after the joint is sawed and or opened. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch below the pavement surface. The rope shall be removed immediately prior to cleaning and or sealing.

605-3.2 EQUIPMENT. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 15 days prior to use on the project.

605-3.3 PREPARATION OF JOINTS *IN NEW PAVEMENT.*

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint faces shall be surface dry when the seal is applied.

Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Back-Up Material. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-Breaking Tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 INSTALLATION OF SEALANTS *IN NEW PAVEMENT.* Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install

the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 PREPARATION OF JOINTS/CRACKS IN EXISTING PAVEMENT

a. Cleaning and Sealing of Cracks. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from the cracks shall be accomplished by routing. Cracks shall be routed so that the exposed face of the crack is enlarged to a width of 1/2" and to a depth as detailed in the sealant manufacturer's recommendations. Other methods of crack cleaning and preparation may be used with the approval of the Engineer.*

b. Cleaning and Sealing of Joints. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from existing joints shall be accomplished via the use of a high temperature compressed air lance. Existing joint sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. Other methods of joint cleaning and preparation may be used ONLY with the approval of the Engineer.*

If vegetation is a problem a soil sterilant shall be applied. Soil sterilants shall contain Bromacil (or equal) or Diuron (or equal) and shall be approved by the Engineer. Application rates shall be maximum recommended by the manufacturer.

When the cracks/joints are thoroughly dry, and just prior to sealant placement, both vertical faces shall be cleaned by sandblasting with a nozzle attached to an aiming device that directs the sand blast at approximately a 45 degree angle and a maximum of two inches from the face of the crack/joint. Each crack/joint face shall be sandblasted individually. After sandblasting, compressed air shall be used to blow out the crack/joint and remove all residual dust. Air compressors shall be equipped with suitable traps capable of removing all free water and oil from the compressed air and shall be capable of furnishing air with a pressure greater than 90 psi. The cracks/joints shall be thoroughly dry before the sealant is placed.

All cracks/joints shall be sealed the same day of the final sandblasting. Cleaned cracks/joints left open overnight or cracks/joints which become contaminated before sealing shall be re-cleaned as specified above.

605-3.6 INSPECTION. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.7 CLEAN-UP. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 *For joint sealing in newly constructed pavements, there will be no measurement for payment under this item. For joint cleaning and re-sealing in existing concrete pavement,* Joint sealing ~~material~~ shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 *For joint sealing in newly constructed pavements, there will be no separate payment under this item. Include costs associated in this item as subsidiary to other items.*

605-5.2 *For joint cleaning and re-sealing in existing concrete pavement,* Payment for joint sealing material shall be made at the contract unit price per **linear foot**. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-1	Concrete Joint Clean and Seal - per Linear Foot

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

END OF ITEM P-605

ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of reinforced structural Portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

Gradation For Coarse Aggregate

Percentage by Weight Passing Sieves	Sieve Designation (square openings)
	No. 4 to 1 in. (4.75-25 mm)
2" (50 mm)	---
1-1/2" (38 mm)	100
1" (25 mm)	90-100
3/4" (19 mm)	---
1/2" (12 mm)	25-60
3/8" (9 mm)	---
No. 4	0-10

610-2.2.1 AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING. Aggregates that have a history of D-cracking shall not be used.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 CEMENT. Cement shall conform to the requirements of **ASTM C 150 Type I or II**.

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

610-2.6 ADMIXTURES AND SUPPLEMENTARY CEMENTITIOUS MATERIAL. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-Entraining Admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

~~**c. Other chemical admixtures.** The use of set retarding, and set- accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set- accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.~~

~~**d. Lithium nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:~~

~~Constituent~~	~~Limit (Percent by Mass)~~
~~LiNO3 (Lithium Nitrate)~~	~~30 ±0.5~~
~~SO4 (Sulfate Ion)~~	~~0.1 (max)~~
~~Cl (Chloride Ion)~~	~~0.2 (max)~~
~~Na (Sodium Ion)~~	~~0.1 (max)~~
~~K (Potassium Ion)~~	~~0.1 (max)~~

~~Provide a trained representative to supervise the lithium nitrate admixture dispensing and mixing operations.~~

e. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of ASTM **D 1752.**

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of **Reinforcing Steel** conforming to the requirements of **ASTM A615.**

610-2.10 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to **one of the following.**

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of **3,000 psi** in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, ±1%, as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 QUALIFICATIONS FOR CONCRETE TESTING SERVICE. Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

610-3.5 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

610-3.6 CONSISTENCY. The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

610-3.7 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

610-3.8 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.9 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

610-3.10 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.11 EMBEDDED ITEMS. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.12 PLACING CONCRETE. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been ~~approved~~ *reviewed by the Engineer*. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.13 VIBRATION. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a

compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

610-3.14 CONSTRUCTION JOINTS. If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.15 EXPANSION JOINTS. Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

610-3.16 DEFECTIVE WORK. Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

610-3.17 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

610-3.18 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

610-3.19 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.20 COLD WEATHER PLACING. When concrete is placed at temperatures below 40°F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F.

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds of Type 1 nor more than 1.6 pounds of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas,

framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F until at least 60% of the designed strength has been attained.

610-3.21 HOT WEATHER PLACING. Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed 90°F when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

610-3.22 FILLING JOINTS. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete shall be ~~measured by the number of cubic yards of concrete complete in place and accepted. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer.~~ *not be measured for separate payment unless otherwise noted.* No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions in yardage shall be made for the volumes of reinforcing steel or embedded items.

610-4.2 Reinforcing steel shall be *not be measured for separate payment.* ~~measured by the calculated theoretical number of pounds placed, as shown on the plans, complete in place and accepted. The unit weight used for deformed bars shall be the weight of plain square or round bars of equal nominal size. If so indicated on the plans, the poundage to be paid for shall include the weight of metal pipes and drains, metal conduits and ducts, or similar materials indicated and included.~~

BASIS OF PAYMENT

610-5.1 Payment shall *not be paid for separately but shall be considered subsidiary to the item in which it is contained, unless otherwise noted.* ~~be made at the contract unit price per cubic yard for structural Portland cement concrete and per pound for reinforcing steel. These prices shall be full compensation for furnishing all materials and for all preparation, delivery and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

~~Payment will be made under:~~

~~Item P-610-5.1 Structural Portland Cement Concrete—per Cubic Yard~~

~~Item P-610-5.2 Steel Reinforcement—per Pound~~

TESTING REQUIREMENTS

ASTM C 31 Making and Curing Test Specimens in the Field

ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 666	Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar- Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A 184	Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 704	Welded Steel Plain Bars or Rod Mats for Concrete Reinforcement
ASTM C 33	Concrete Aggregates
ASTM C 94	Ready-Mixed Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheet Materials for Curing Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 595	Blended Hydraulic Cements
ASTM C 618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T 26	Quality of Water to be Used in Concrete
ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 MARKING MATERIALS. Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2. Paint shall be furnished in **White (37925), Red (31136), Yellow (33538 or 33655), or Black (37038)** in accordance with Federal Standard No. 595.

a. WATERBORNE. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type I. The non- volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

~~**b. EPOXY.** Paint shall be a two component, minimum 99% solids type system conforming to the following:~~

~~**(1) Pigments.** Component A. Percent by weight.~~

~~**(a) White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 18% minimum (16.5% minimum at 100% purity).~~

~~**(b) Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 14 to 17%.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~Epoxy resin shall be 75 to 79%.~~

~~**(2) Epoxy Content.** Component A. The weight per epoxy equivalent, when tested in accordance with ASTM D1652 shall be the manufacturer's target ±50.~~

~~**(3) Amine Number.** Component B. When tested in accordance with ASTM D2074 shall be the manufacturer's target ±50.~~

~~**(4) Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~(5) Daylight Directional Reflectance:~~

~~(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.~~

~~(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:~~

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

~~(6) Accelerated Weathering.~~

~~(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.~~

~~(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.~~

~~(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2b(5) above. Evaluate for conformance with the color requirements.~~

~~(7) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.~~

~~(8) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.~~

~~(9) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.~~

~~(10) Hardness, Shore. Hardness shall be at least 80 when tested in accordance with ASTM D2240.]~~

~~c. METHACRYLATE. Paint shall be a two component, minimum 90% solids type system conforming to the following:~~

~~(1) Pigments. Component A. Percent by weight.~~

~~(a) White:~~
~~Titanium Dioxide, ASTM D476, type II shall be 8% minimum. Methacrylate resin shall be 18% minimum.~~

~~(b) Yellow and Colors:~~

~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

Organic yellow, other colors, and tinting as required to meet color standard.

Methacrylate resin shall be 18% minimum.

(2) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(3) Daylight Directional Reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x	.462	x .470	x .479	x .501
y	.438	y .455	y .428	y .452

(4) Accelerated Weathering.

(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2c(3) above. Evaluate for conformance with the color requirements.

(5) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.

(7) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels. Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.

(8) Hardness, Shore. Hardness shall be at least 60 when tested in accordance with ASTM D2240.

d. SOLVENT BASE. Paint shall meet the requirements of Commercial Item Description A-A-2886B Type I, Type II, and Type III.

~~e. **PREFORMED THERMOPLASTIC AIRPORT PAVEMENT MARKINGS.** Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.~~

~~(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.~~

~~(a) The markings must be supplied with an integral, non-reflectorized black border.~~

~~**(2) Graded Glass Beads.**~~

~~(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type IV.~~

~~(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (±10%) per 10 square feet. These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.~~

~~Size Gradation~~		~~Retained, %~~	~~Passing, %~~
~~US Mesh~~	~~µm~~		
~~12~~	~~1700~~	~~0—2~~	~~98—100~~
~~14~~	~~1400~~	~~0—3.5~~	~~96.5—100~~
~~16~~	~~1180~~	~~2—25~~	~~75—98~~
~~18~~	~~1000~~	~~28—63~~	~~37—72~~
~~20~~	~~850~~	~~63—72~~	~~28—37~~
~~30~~	~~600~~	~~67—77~~	~~23—33~~
~~50~~	~~300~~	~~89—95~~	~~5—11~~
~~80~~	~~200~~	~~97—100~~	~~0—3~~

~~**(3) Heating Indicators.** The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.~~

~~**(4) Pigments.** Percent by weight.~~

~~**(a) White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 10% minimum.~~

~~**(b) Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~**(5) Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~**(6) Daylight Directional Reflectance.**~~

~~**(a) White:**~~

The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x	.462	x .470	x .479	x .501
y	.438	y .455	y .428	y .452

(7) Skid Resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil.

(9) Environmental Resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed Thermoplastic Airport Pavement Marking Requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross-sectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be re-opened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements for **Federal Specification TT-B-1325D, Type I, Gradation A.** Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. **Painting operations shall be discontinued when the surface temperature exceeds 120°F.** Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by **waterblasting** or by other methods as required to remove all contaminants while minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. *Grinding of the pavement will not be permitted.* After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are cleaned of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

At least 24 hours prior to remarking existing markings, the existing markings must be ~~removed~~ *prepared* **such that ~~75% existing markings are removed~~** *any loose or contaminated material that will affect the bond of the new paint are removed.* **After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air or both.** *The preparation is NOT to damage the pavement around and beneath the paint being prepared for remarking. Any damage is to be corrected immediately at no additional cost to the Owner.*

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by

the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of **30 days** shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 TEST STRIP. Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS
~~(See Note Regarding Red and Pink Paint)~~

Paint Type	Paint Square feet per gallon, ft^2/gal	Glass Beads, Type I, Gradation A Pounds per gallon of paint—lb./gal.	Glass Beads, Type III Pounds per gallon of paint—lb./gal.	Glass Beads, Type IV Pounds per gallon of paint—lb./gal.
Waterborne Type I	115 ft^2/gal max	7 lb/gal min (0.85 kg/l)	--	--

When pavement markings are required on a newly placed pavement, the pavement markings shall be completed in two applications. The first application shall be 33% of the application rate specified in Table 1. The second application shall be 100% of the application rate specified in Table 1, placed in the opposite direction of the first pass. Glass beads shall only be included in the second application of the pavement markings.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 APPLICATION – PREFORMED AIRPORT PAVEMENT MARKINGS.

a. Asphalt and Portland Cement To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet and a free span between supporting wheels of no less than 18 feet. The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.

620-3.8 PROTECTION AND CLEANUP. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

620-3.9 REMOVAL OF EXISTING MARKINGS. *The existing pavement markings shown on the plans to be removed shall be removed without damaging the existing pavement. The markings shall be removed through the use of high-pressure water or other methods approved by the Engineer before removal operations begin. For areas to be repainted, the existing painted surface shall be cleaned by high-pressure water blasting or sand blasting, as required, to remove all foreign material which would reduce the bond between the new paint and the old paint.*

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be **the number of square feet of painting including reflective media when required ~~and the number of pounds of reflective media~~** performed in accordance with the specifications and accepted by the Engineer. *Where multiple pavement marking applications are specified, there will be no separate payment for temporary pavement markings (first pass). If either the temporary or final application of pavement markings are not required, the contract quantity shall be adjusted according to the markings actually completed.*

The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting including reflective media when required, performed in accordance with the specifications and accepted by the Engineer.

620-5.2 *Payment shall be made at a lump sum price for paint marking removal. The price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.*

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract **price per square foot** for runway and taxiway painting and for reflective media *and lump sum for pavement marking removal. For paint markings*

placed on existing pavement markings, there is no separate pay for pavement marking preparation as described in this item and is to be considered inclusive of the pavement markings pay item. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1	Retro-Reflective Pavement Markings - per square foot
Item P-620-2	Non-Reflective Black Outline - per square foot
Item P-620-3	Pavement Marking Removal - per lump sum

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D
Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247 Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E
Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B

Paint, Traffic, Solvent Based

FED STD 595 Colors used in Government Procurement

AC 150/5340-1 Standards for Airport Markings

END OF ITEM P-620

ITEM P-631 REFINED COAL TAR EMULSION WITH ADDITIVES, SLURRY SEAL SURFACE TREATMENT

DESCRIPTION

631-1.1 This item shall consist of a mixture of emulsified asphalt, mineral aggregate, and water properly proportioned, mixed, and spread on an asphalt pavement surface, including airport pavements serving airplanes 12,500 lbs or less, roads, and other general applications. The purpose of this refined coal tar emulsion product is to provide a fuel-resistant surface where pavements are subjected to fuel spills. The application of the surface treatment shall be in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer.

631-1.2 GENERAL. This item shall consist of a mixture of refined coal tar emulsion, mineral aggregate, additives, and water properly proportioned, mixed and applied as a slurry seal on new or existing (aged) asphalt concrete pavement.

MATERIALS

631-2.1 REFINED COAL TAR EMULSION. A refined coal tar emulsion prepared from a high temperature refined coal tar conforming to the requirements of ASTM D490 for grade 11-12. The use of oil and water gas tar is not allowed. Base refined coal tar emulsion must conform to all requirements of ASTM D5727.

a. Health, safety, and environment. The Contractor must provide a complete Material Safety Data Sheet (MSDS) in accordance with U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations (Standards – 29 CFR, 1910.1200) which establishes the requirement and minimum information for the MSDS for hazardous materials. The MSDS, Section II, shall include the Chemical Abstracts Service (CAS) registry numbers for all applicable hazardous ingredients in the coal tar emulsion product. The Contractor must provide the manufacturer's certification that the product complies with the Code of Federal Regulation (CFR) Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products (for the airport location) and Water Programs, Part 116, Designation of Hazardous Substances.

631-2.2 AGGREGATE. The aggregate shall be washed dry silica sand or boiler slag free of dust, trash, clay, organic materials or other deleterious substances. The aggregate shall meet the gradation in Table 1, when tested in accordance with ASTM C136.

Table 1. Gradation Of Aggregates*

Sieve Size		Percent Retained	
		Minimum	Maximum
#20 or coarser	(0.850 mm)	0	2
#30	(0.600 mm)	0	12
#40	(0.425 mm)	2	60
#50	(0.300 mm)	5	60
#70	(0.212 mm)	5	60
#100	(0.150 mm)	5	30
#140	(0.106 mm)	0	10
#200	(0.075 mm)	0	2
Finer than #200		0	0.3

* Table 1 represents the maximum range of aggregate gradations. In all cases the refined coal tar emulsion supplier is to give written approval of the aggregate used in the mix design.

631-2.3 ADDITIVE. As specified by the coal tar emulsion manufacturer.

631-2.4 WATER. Water for mixing shall be potable, free of harmful soluble salts, and at least 50°F.

631-2.5 CRACK SEALANT. Crack sealant shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.6 OIL SPOT PRIMER. Oil spot primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.7 PAVEMENT PRIMER. Pavement primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

COMPOSITION AND APPLICATION

631-3.1 COMPOSITION. The refined coal tar emulsion seal coat is to consist of a mixture of refined coal tar emulsion, water, additive and aggregate, and be proportioned as shown in Table 2. The composition must have written approval of the coal tar emulsion manufacturer.

631-3.2 QUANTITIES OF MATERIALS PER SQUARE YARD. The Contractor shall submit the recommended formulation of water, emulsion, aggregate and application rate proposed for use to a testing laboratory together with sufficient materials to verify the formulation at least 5 days prior to the start of operations. The mix design shall be within the range shown in the below table. No seal coat shall be produced for payment until a mix has been approved by the Engineer. The formulation shall pass the fuel resistance test in Addendum A.

The mix for each mixture shall be in effect until modified in writing by the Engineer.

Table 2. Composition Of Mixture Per 100 Gallons Of Refined Coal Tar Emulsion

Application	Refined Coal Tar Emulsion Gallons	Water Gallons	Additive Gallons	Aggregate Pounds	Formula Rate of Application of Mix per Square Yard	
					Minimum Gallons	Maximum Gallons
Prime Coat (where required) as specified by the coal tar emulsion manufacturer						
1st Seal Coat	100	25-70	2-6	300-700	0.12	0.20
2nd Seal Coat	100	25-70	2-6	300-700	0.12	0.20

631-3.3 APPLICATION RATE. Application rates are not to exceed 0.20 gal/yd^2/coat and at no time are total coats to exceed 0.51 gal/yd^2

631-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of mixture in the proportions shown in the approved mix design. The amount of mixture shall be sufficient to place a test section a minimum of 250 square yard at the rate specified in the job mix formula. The test area will be designated by the Engineer on a representative section of the pavement to be seal coated. The actual application rate will be determined by the Engineer during placement of the test section and will depend on the condition of the pavement surface.

The test section shall be used to verify the adequacy of the mix design and to determine the application rate. The same equipment and method of operations shall be used on the test section that will be used on the remainder of the work.

If the test section should prove to be unsatisfactory, the necessary adjustments to the job mix formula, mix composition, application rate, placement operations, and equipment shall be made. Additional test sections shall be placed and evaluated, if required. Full production shall not begin without the Engineer's approval. Acceptable test sections shall be paid for in accordance with paragraph 631-7.1.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying test areas and/or test sections to determine the optimum application rate of both emulsion and sand.

CONSTRUCTION METHODS

631-4.1 WEATHER LIMITATIONS. The seal coat shall not be applied when the surface is wet or when the humidity or impending weather conditions will not allow proper curing. The seal coat shall be applied only when the atmospheric or pavement temperature is 50°F and rising and is expected to remain above 50°F for 24 hours, unless otherwise directed by the Engineer.

631-4.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Distributors. Distributors or spray units used for the spray application of the seal coat shall be self-propelled and capable of uniformly applying 0.12 to 0.55 gallons per square yard of material over the required width of application. Distributors shall be equipped with removable manhole covers, tachometers, pressure gauges, and volume-measuring devices.

The mix tank shall have a mechanically powered, full-sweep, mixer with sufficient power to move and homogeneously mix the entire contents of the tank.

The distributor shall be equipped with a positive placement pump so that a constant pressure can be maintained on the mixture to the spray nozzles.

b. Mixing equipment. The mixing machine shall have a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, and emulsion, and of discharging the thoroughly mixed product on a continuous basis. The mixing unit shall be capable of thoroughly blending all ingredients together and discharging the material to the spreader box without segregation.

c. Spreading equipment. Spreading equipment shall be a mechanical-type squeegee distributor attached to the mixing machine, equipped with flexible material in contact with the surface to prevent loss of slurry from the spreader box. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; coal tar emulsion and aggregate build-up on the box shall not be permitted.

d. Hand squeegee or brush application. The use of hand spreading application shall be restricted to places not accessible to the mechanized equipment or to accommodate neat trim work at curbs, etc. Material that is applied by hand shall meet the same standards as that applied by machine.

e. Calibration. The Contractor shall furnish all equipment, materials and labor necessary to calibrate the equipment. It shall be calibrated to assure that it will produce and apply a mix that conforms to the job mix formula. Commercial equipment should be provided with a method of calibration by the manufacturer. All calibrations shall be made with the approved job materials prior to applying the seal coat to the pavement. A copy of the calibration test results shall be furnished to the Engineer.

631-4.3 PREPARATION OF ASPHALT PAVEMENT SURFACES. Clean pavement surface immediately prior to placing the seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface

film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with paragraph 101-3.6.

631-4.4 MIXING. Blend the coal tar emulsion mixture in the equipment described in paragraph 631-4.2 using the ingredients described in Table 2. The mixing must produce a smooth homogeneous mixture of uniform consistency. (Consult coal tar emulsion supplier for its recommended order of addition of the ingredients.) During the entire mixing and application process, no breaking, segregating or hardening of the emulsion, nor balling or lumping of the sand is to be permitted. Continue to agitate the seal coating mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application.

Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the specified amount.

631-4.5 APPLICATION OF SLURRY SEAL SURFACE TREATMENT. The aggregate filled slurry seal surface treatment shall be applied at a uniform rate determined in paragraph 631-3.3.

In order to provide maximum adhesion, the pavement shall be dampened with a fog spray of water if recommended by the supplier. No standing water shall remain on the surface.

If a prime coat is required, mix and apply the prime coat as specified in paragraph 631-4.3.

Apply the first coat uniformly to obtain the rate determined in paragraph 631-3.3.

Each coat shall be allowed to dry and cure initially before applying any subsequent coats. The initial drying shall allow evaporation of water of the applied mixture, resulting in the coating being able to sustain light foot traffic. The initial curing shall enable the mixture to withstand vehicle traffic without damage to the seal coat.

Apply the second coat in the same manner as outlined for the first coat.

Additional coats shall be applied over the entire surface as directed by the Engineer.

The finished surface shall present a uniform texture.

The final coat shall be allowed to dry a minimum of eight hours in dry daylight conditions before opening to traffic, and initially cure enough to support vehicular traffic without damage to the seal coat.

Where marginal weather conditions exist during the eight hour drying time, additional drying time shall be required. The length of time shall be as specified by the supplier. The surface shall be checked after the additional drying time for trafficability before opening the section to vehicle traffic.

Where striping is required, the striping paint used shall meet the requirements of P-620, shall be compatible with the seal coat and as recommended by the coal tar emulsion manufacturer.

QUALITY CONTROL

631-5.1 CONTRACTOR'S CERTIFICATION. The Contractor shall furnish the manufacturer's certification that each consignment of emulsion shipped to the project meets the requirements of ASTM D5727, except that the water content shall not exceed 50%. The certification shall also indicate the solids and ash content of the emulsion and the date the tests were conducted. The certification shall be delivered to the Engineer prior to the beginning of work. The manufacturer's certification for the emulsion shall not be interpreted as

a basis for final acceptance. Any certification received shall be subject to verification by testing samples received for project use.

The Contractor shall also furnish a certification demonstrating a minimum of three years of experience in the application of coal tar emulsion seal coats.

631-5.2 INSPECTION. The Contractor shall have an independent technical consultant on the job site at the beginning of operations for application of coal tar emulsion seal coats. The consultant shall have knowledge of the materials, procedures, and equipment described in this specification and shall assist the Contractor regarding proper mixing of the component materials and application of the seal coat. The consultant shall have a minimum of three (3) years of experience in the use of coal tar seal coats.

Documentation of this experience shall be furnished to the Engineer prior to the start of operations. The cost of the technical consultant shall be paid for by the Contractor.

631-5.3 SAMPLING. A minimum of one sample per day shall be tested for the properties of Table 2. A random sample of approximately one-quart of the composite mix will be obtained daily by the Contractor and stored in a glass container. The containers shall be sealed against contamination and retained in storage by the Owner for a period of six months. Samples shall be stored at room temperature and not be subjected to freezing temperatures.

A sample of undiluted coal tar emulsion shall be obtained from each consignment shipped to the job.

631-5.4 ENGINEER'S RECORDS. The Engineer will keep an accurate record of each batch of materials used in the formulation of the seal coat.

METHOD OF MEASUREMENT

631-6.1 The refined coal tar emulsion with additives shall be measured by the gallon. Only the actual quantity of undiluted refined coal tar emulsion with additives will be measured for payment.

631-6.2 Aggregate shall be measured by the ton of dry aggregate.

BASIS OF PAYMENT

631-7.1 Payment shall be made at the contract unit price per square yard for the refined coal tar emulsion with additives ~~and at the contract price per ton for aggregate~~.

These prices shall be full compensation for furnishing all materials, preparing, mixing, and applying these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat - per Square Yard

TESTING REQUIREMENTS

29 CFR Part 1910.1200 Hazard Communication

ASTM C67 Standard Test Method for Sampling and Testing Brick and Structural Clay Tile

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D5727	Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type)

MATERIAL REQUIREMENTS

ASTM D490	Standard Specification for Road Tar
ASTM D692	Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
ASTM D3699	Standard Specification for Kerosene
ASTM D4866	Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formations Containing Mineral Aggregates and Optional Polymeric Admixtures

END OF ITEM P-631

ADDENDUM A

ITEM P-631 FUEL RESISTANCE TEST AND CRITERION

1. **Scope**

This method determines the resistance of the coal tar emulsion seal coat to kerosene.

2. **Apparatus**

2.1. Two 6" □□6" square 16 gauge sheet metal masks with a 4" □□4" square center removed

2.2. 6" □□6" unglazed white ceramic tile with an absorption rate of 10- 18% (determined in accordance with ASTM C67

Brass ring, 2" diameter and 2" high

2.3. Kerosene meeting requirements of ASTM D3699

2.4. Silicone rubber sealant

3. **Procedure**

3.1. Immerse the ceramic tile in distilled water for a minimum of ten minutes.

3.2. Remove excess water from the tile to produce a damp surface before applying the seal coat.

3.3. Using the mask described in 2.1 apply one layer of the coal tar emulsion mixture to the tile. Spread even with the top of the mask using a spatula or other straightedge.

3.4. Allow the sample to cure for 96 hours at 77 ±2°F. and 50 ±10% relative humidity.

3.5. Position a second mask on top of the first mask.

3.6. Apply a second coat of coal tar emulsion mixture. Spread even with the top of the second mask.

3.7. Cure as in step 3.4.

3.8. After curing, affix the brass ring to the seal coat on the tile with silicone rubber sealant.

3.9. Fill the brass ring with kerosene.

3.10. After 24 hours, remove the kerosene from the brass ring, blot dry and immediately examine the film for softness and loss of adhesion. Immediately after the film is examined, break the tile in half, exposing that part of the tile whose film was subjected to the kerosene.

3.11. Evaluate for penetration of kerosene through the sealer and loss of adhesion.

4. **Report**

Report the results as pass or fail. Visible evidence of leakage or discoloration shall constitute failure of the fuel resistance test.

5. **Criterion:** A "pass" rating in the fuel resistance test is required prior to full production.

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ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding *fertilizing, and watering* the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

MATERIALS

901-2.1 SEED The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb/acre (or lb/1,000
Green Sprangletop	*	*	**0.3**
Bermudagrass	*	*	**15.0**
Sideoats Grama (Haskell)	*	*	**4.5**

Seeding shall be performed during the period between **January 15** and **May 15** inclusive, unless otherwise approved by the Engineer.

~~**901-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [ ] All liming materials shall conform to the requirements of ASTM C 602.~~

901-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be ***30-30-30*** commercial fertilizer and shall be spread at the rate of **150 pounds per acre.**

901-2.4 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and before applying fertilizer ~~and ground limestone~~, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer ~~and ground limestone~~, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be *completely eradicated by means of herbicide or tillage* ~~cut or otherwise satisfactorily disposed of~~, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 DRY APPLICATION METHOD.

~~**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.~~

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 WET APPLICATION METHOD.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb / sq inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 MAINTENANCE OF SEEDED AREAS. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

Watering of the seeded areas shall be coordinated with the Owner and Airport Operations. Contractor will not be permitted to enter the airport secure areas to water without advanced approval.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units **acres** measured on the ground surface, completed and accepted. *Seeding shall be measured to the nearest tenth (0.1) of an acre. Fertilizer and watering will not be measured for separate payment but will be considered subsidiary to seeding.*

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per **acre** or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-1	Seeding, Including Fertilizing and Watering - per acre

MATERIAL REQUIREMENTS

ASTM C 602	Agricultural Liming Materials
ASTM D 977	Emulsified Asphalt
FED SPEC JJJ-S-181	Seeds, Agriculture

END OF ITEM T-901

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ITEM T-904 SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

904-2.1 SOD. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. ~~At least 70% of the plants in the cut sod shall be composed of the species stated in the Texas Department of Transportation Standard Specifications, — *Sodding* special provisions, and~~ *Sod may be either of Bermuda grass or buffalo grass.* Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the ~~special provisions.~~ *Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 162. Sod must be free from noxious weeds, Johnson grass, seed producing grasses, or any other matter deleterious to the growth and subsistence of the sod.*

~~**904-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [___]. All liming materials shall conform to the requirements of ASTM C602.~~

904-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be standard commercial fertilizer and shall be spread at the rate *dictated by the representative soils test conducted by the contractor.*

904-2.4 WATER. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

904-2.5 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

904-3.1 GENERAL. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 PREPARING THE GROUND SURFACE. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

904-3.3 APPLYING FERTILIZER AND GROUND LIMESTONE. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches by discing, raking, or other suitable methods. Any stones larger than 2 inches in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 OBTAINING AND DELIVERING SOD. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 LAYING SOD. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 sq inch. The pegs shall be driven flush with the surface of the sod.

904-3.6 WATERING. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.7 ESTABLISHING TURF.

a. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

b. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

c. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

904-3.8 REPAIRING. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be sodded as specified in paragraph 904-3.5.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-1	Sodding - per square yard

MATERIAL REQUIREMENTS

ASTM C 602	Standard Specification for Agricultural Liming Materials

END OF ITEM T-904

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 TOPSOIL. *Topsoil source to be existing topsoil within the limits of the grading as shown on the Plans, and temporarily stockpiling topsoil on the airport property at a location acceptable to the airport and the Engineer.* Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. ~~The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117.~~ *~~Topsoil testing shall be completed and paid for by the Contractor.~~*

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 INSPECTION AND TESTS. Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 GENERAL. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 PREPARING THE GROUND SURFACE. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of

capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 PLACING TOPSOIL. The topsoil shall be evenly spread on the prepared areas to a uniform depth of inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil obtained on the site shall be measured by the ***area in square yards of the specified thickness of topsoil re-handled and placed from the topsoil stockpiled under item P-152-2.10 as accepted by the Engineer. Topsoiling measured for payment shall only be the planned limits of construction.*** ~~number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoiling by the Contractor shall be measured by the number of cubic yards of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

~~**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per ~~cubic yard~~ *square yard of the specified thickness* for topsoiling (obtained on the site). This price shall be full compensation for furnishing all materials and for all *stripping and stockpiling topsoil at the airport, hauling,* preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

~~**905-5.2** Payment will be made at the contract unit price per cubic yard for topsoiling (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

Payment will be made under:

Item T-905-1	Topsoiling (Obtained on Site or Removed from Stockpile; 2" Thickness) - per square yard

TESTING MATERIALS

ASTM C 117 Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

END OF ITEM T-905

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ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications, at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 WIND CONES. The primary wind cone assembly shall be Type L-807(L) (Rigid Supporting Structure), Style I-B (Internally Lighted), Size 2 (36" Diameter by 12' Long) meeting the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

107-2.3 ELECTRICAL WIRE AND CABLE. Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

107-2.5 PLASTIC CONDUIT (for use below grade only). Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete.

107-2.7 PAINT

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification - Paint 25, Primer, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

107-3.2 SUPPORT POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTIONS. The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

~~**107-3.4 BOOSTER TRANSFORMER.** If shown in plans or specified in the job specifications, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof housing. The booster transformer shall be installed as indicated in the plans and described in the proposal. If the booster transformer is required for installation remotely from the wind cone, it shall be installed in accordance with and paid for per as described in Item L-109, Airport Transformer Vault and Vault Equipment.~~

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 4 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

107-3.6 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

107-3.7 LIGHT SOURCES. The Contractor shall furnish and install lamps per the manufacturer's instruction book.

107-3.8 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

107-3.9 SEGMENTED CIRCLE. The segmented circle shall be constructed in accordance with AC 150/5340-5, Segmented Circle Airport Marker System, and the details in the Plans.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

107-4.2 The quantity of segmented circle airport marker systems to be paid for shall be the number of systems installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107-5.1	L-807(L), Style I-B, Size 2 Wind Cone and Foundation, in Place – per Each
Item L-107-5.2	Segmented Circle Marker System, In Place – per Each

MATERIAL REQUIREMENTS

AC 150/5340-5	Segmented Circle Airport Marker System
AC 150/5340-30	Design and Installation Details for airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description. Spec A-A-3067	*Paint: Alkyd, Exterior, Low VOC*
Fed. Spec. TT-P-664D	*Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant*
Fed. Spec. W-C-1094	*Conduit and Conduit Fittings, Plastic, Rigid*
FED STD 595	Colors Used in Government Procurement
MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit – Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit - Steel
NFPA-70	National Electric Code (NEC)

END OF ITEM L-107

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ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in Item L-110, Airport Underground Electrical Duct Banks and Conduits.

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual aid Facilities, Table 5-

1 and paragraph 5.1.3.1, with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. ~~Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 [Type B] [Type C], 5,000 volts, nonshielded, with [ethylene propylene insulation] [cross-linked polyethylene insulation].~~ L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for ground wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or an approved equivalent, used for potting the splice is acceptable.

b. The Field-Attached Plug-In Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

c. The Factory-Molded Plug-In Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The Taped or Heat-Shrink Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 TAPE. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 Inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 ELECTRICAL COATING. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 EXISTING CIRCUITS. Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be

performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders

shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

(1) When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.

(2) Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 item.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 inches (75 mm) deep, loose measurement, and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the compaction requirements per Item P-152 for that area shall be followed.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inch (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, and seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep.

At the location of each underground cable connection, except at lighting units, or isolation transformers, or power a concrete marker slab must mark adapters placed above the connection. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted International orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

a. Equipotential. – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

b. Isolation – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables.

For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

For raceways installed under pavement; for raceways and cables not installed adjacent to the full strength pavement edge; for fixtures installed in full strength pavement and shoulder pavement ~~and for optional method of edge lights installed in turf (stabilized soils); and for raceways or cables adjacent to the full strength pavement edge~~, the counterpoise conductor shall be centered over the raceway or cable to be protected as described below.

The counterpoise conductor shall be installed no less than 8 inches (203 mm) above the raceway or cable to be protected, except as permitted below.

The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise conductor shall be installed no more than 12 inches (305 mm) above the raceway or cable to be protected.

The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection.

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

c. A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

d. For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

108-3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall include additional quantities required for slack.

~~**108-4.3** Ground rods shall be measured by each [10 foot] section installed complete.~~

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	Trenching for Direct-Buried Cable, 18 Inch Minimum Depth – per Linear Foot
Item L-108-5.2	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit – per Linear Foot
Item L-108-5.3	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.4	No. 1/0 AWG, Stranded, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.5	Trenching for Direct-Buried Bare Counterpoise Wire, 8" Minimum Depth – per Linear Foot
Item L-108-5.6	No. 6 AWG Stranded, 600V Rated, Type THHN/THWN-2 Cable, Installed in Duct Bank or Conduit – per Linear Foot
Item L-108-5.7	No. 8 AWG Stranded, 600V Rated, Type THHN/THWN-2, Green Insulated Equipment Ground, Installed in Duct Bank or Conduit – per Linear Foot

MATERIAL REQUIREMENTS

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D33	*Tinned Soft of Annealed Copper Wire for Electrical Purposes*
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive
MIL-P-21035	*Paint High Zinc Duct Content, Galvanizing Repair*

REFERENCE DOCUMENTS

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems
MIL-S-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

~~**110-2.2 STEEL CONDUIT.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10~~

~~mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.~~

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I – Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II – Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III – HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28-day compressive strength of 3500 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work

progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated

before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, and seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Non-Encased, Electrical Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.2	Non-Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.3	Non-Encased, Schedule 40 PVC Drain Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.4	Encased, Electrical Conduit, 1-Way 2"C, with Flowable Fill and Sawcut Pavement Repair – per Linear Foot
Item L-110-5.5	Concrete Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.6	FAA-Style, Concrete Encased, Split Duct Conduit, 1-Way 3"C – per Linear Foot

MATERIAL REQUIREMENTS

Advisory Circular (AC) 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NFPA-70	National Electrical Code (NEC)
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit - Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit Steel
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This Item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This Item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel*. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

~~**115-3.13 MANHOLE ELEVATION ADJUSTMENTS.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.~~

~~The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.~~

~~The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.~~

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections

- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

~~**115-4.2** Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.~~

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

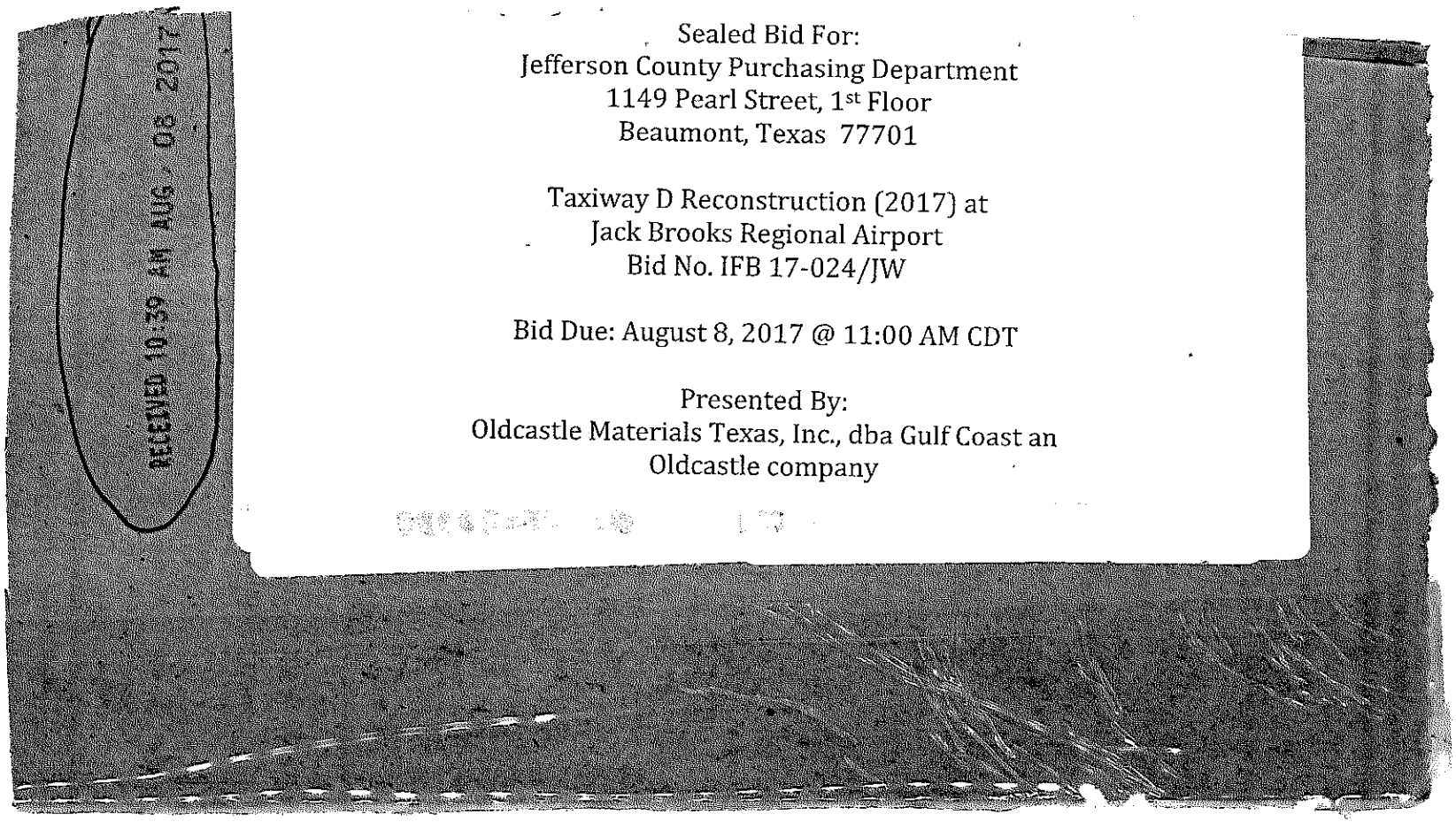
Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	FAA-Style, Precast Concrete Electrical Handhole, Aircraft-Rated, 3'Lx3'Wx3'D, Installed – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

1440



Sealed Bid For:
Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, Texas 77701

Taxiway D Reconstruction (2017) at
Jack Brooks Regional Airport
Bid No. IFB 17-024/JW

Bid Due: August 8, 2017 @ 11:00 AM CDT

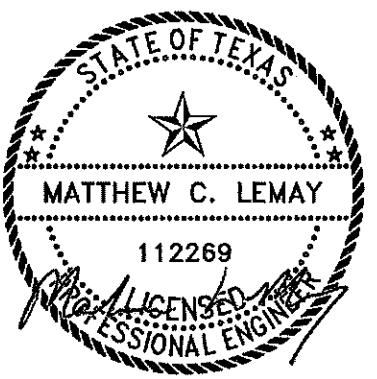
Presented By:
Oldcastle Materials Texas, Inc., dba Gulf Coast an
Oldcastle company

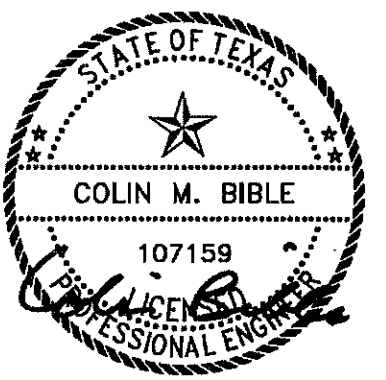
JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
(WARE RAMP TO TAXIWAY 'F')

AIP NO. 3-48-0018-034-2017

JEFFERSON COUNTY COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

Jefferson County Project 17-024/JW





Garver Project Number 17121501

July 2017

SECTION G
CONTRACT

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

W I T N E S S E T H:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Two-Hundred and Seventy Four (274)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

SECTION H
NOTICE OF AWARD AND NOTICE TO PROCEED

NOTICE OF AWARD

DATED:_____ , 2017

TO: .

ADDRESS:

PROJECT OWNER: JEFFERSON COUNTY

FAA AIP GRANT No. 3-48-0018-034-2017

CONTRACT FOR: TAXIWAY D RECONSTRUCTION (2017) TAXIWAY F TO JERRY WARE APRON

CONSTRUCTION OF: JACK BROOKS REGIONAL AIRPORT

****

You are notified that your Bid dated XXX, 2017 for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for Base Bid with Additive Alternate No. X .

The Contract Price of your contract is_____ dollars and no /100 ($XXXXXX).

You must comply with the following conditions precedent within FIFTEEN (15) days of the date of this *Notice of Award* that is by, XXXXX, 2017

1. You must deliver to the **OWNER 4** fully executed counterparts of the Agreement including all the Contract Documents.

2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Advertisement for Bids, General Conditions (Article 2), and Supplementary Conditions.

3. You must deliver to the **OWNER 4** original ***Certificates of Insurance***, naming the Owner ***(Jefferson County)*** and Engineer ***(Garver, LLC.)*** and their respective agents and employees, to be expressly named as additional insured's, in accordance with the General Conditions.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid in default, to annul this Notice of Award, and to declare your Bid Security forfeited.

Within ten (10) days after you comply with the above conditions, OWNER will return to you one (1) fully signed counterpart of the Agreement with the Contract Documents attached.

Sincerely,

GARVER, LLC

Thomas D Dodson, PE

Senior Project Manager

ACCEPTANCE OF AWARD:

CONTRACTOR:

_____

BY:_____

TITLE:_____

DATE:_____

XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 274 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXXX, 2017.

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Thomas D Dodson, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

SECTION I
PERFORMANCE AND PAYMENT BONDS
CERTIFICATE OF INSURANCE

PAYMENT BOND

PERFORMANCE BOND

INSERT INSURANCE DOCUMENTS HERE

SECTION J
GENERAL PROVISIONS
(FAA AC 150/5370-10G)

GENERAL PROVISIONS

SECTION 10
DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-1 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-2 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-3 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-4 AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-5 AIR OPERATIONS AREA (AOA). For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-6 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

10-7 ASTM INTERNATIONAL (ASTM). Formerly known as the American Society for Testing and Materials (ASTM).

10-8 AWARD. The Owner's notice to the successful bidder of the acceptance of the submitted bid.

10-9 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 CALENDAR DAY. Every day shown on the calendar.

10-12 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.

10-13 CONTRACT. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract.Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

10-14 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-15 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 CONTRACTOR'S LABORATORY. The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

10-18 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-19 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-20 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.

10-21 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-22 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-23 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

10-24 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-25 FORCE ACCOUNT. Force account work is planning, engineering, or construction work done by the Sponsor's employees.

10-26 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections, observations and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-27 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or

cited standard that may be pertinent to such specific reference.

10-28 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as "Engineer's Laboratory" or "quality assurance laboratory."

10-29 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-30 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-31 MATERIALS. Any substance specified for use in the construction of the contract work.

10-32 NOTICE TO PROCEED (NTP). A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-33 OWNER. The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only.

10-34 PASSENGER FACILITY CHARGE (PFC). Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls."

10-35 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 PAYMENT BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-37 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-38 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-39 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-40 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-41 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

10-42 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-43 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-44 SPONSOR. A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-45 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-46 SUBGRADE. The soil that forms the pavement foundation.

10-47 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-49 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-50 TAXIWAY. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

10-51 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-52 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10

SECTION 20
PROPOSAL REQUIREMENTS AND CONDITIONS

20-1 ADVERTISEMENT (NOTICE TO BIDDERS). *(See Page A-2)*

20-2 QUALIFICATION OF BIDDERS. Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year.

Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.
Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

20-3 CONTENTS OF PROPOSAL FORMS. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-4 ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-5 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the

quantities may be increased or decreased as hereinafter provided in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

20-6 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications. **Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.**

20-7 PREPARATION OF PROPOSAL. The bidder shall submit his or her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. If so requested, the bidder shall state the price (written in ink or typed) both in words and numerals for which they propose to do for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign the proposal correctly and in ink. If the proposal is made by an individual, his or her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his or her authority to do so and that the signature is binding upon the firm or corporation.

20-8 RESPONSIVE AND RESPONSIBLE BIDDER. A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-9 IRREGULAR PROPOSALS. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 BID GUARANTEE. Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

20-11 DELIVERY OF PROPOSAL. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 WITHDRAWAL OR REVISION OF PROPOSALS. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by fax or email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 PUBLIC OPENING OF PROPOSALS. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 DISQUALIFICATION OF BIDDERS. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20

SECTION 30
AWARD AND EXECUTION OF CONTRACT

30-1 CONSIDERATION OF PROPOSALS. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-2 AWARD OF CONTRACT. The award of a contract, if it is to be awarded, shall be made within *the amount specified in the advertisement and proposal in* calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

30-3 CANCELLATION OF AWARD. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

30-4 RETURN OF PROPOSAL GUARANTY. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

30-5 REQUIREMENTS OF CONTRACT BONDS. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-6 EXECUTION OF CONTRACT. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section, within calendar days from the date mailed or otherwise delivered to the successful bidder.

30-7 APPROVAL OF CONTRACT. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-8 FAILURE TO EXECUTE CONTRACT. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

END OF SECTION 30

SECTION 40
SCOPE OF WORK

40-1 INTENT OF CONTRACT. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-2 ALTERATION OF WORK AND QUANTITIES. The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

40-3 OMITTED ITEMS. The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item.

Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-4 EXTRA WORK. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work". Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-5 MAINTENANCE OF TRAFFIC. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration.

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire- rescue equipment, or maintenance vehicles at the airport.

c. When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-6 REMOVAL OF EXISTING STRUCTURES. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-7 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, the Contractor may at his or her option either:

a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the Engineer; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-8 FINAL CLEANUP. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property Owner.

END OF SECTION 40

SECTION 50
CONTROL OF WORK

50-1 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

50-2 CONFORMITY WITH PLANS AND SPECIFICATIONS. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-3 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs);

contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the Engineer for an interpretation and decision, and such decision shall be final.

50-4 COOPERATION OF CONTRACTOR. The Contractor will be supplied with three copies each of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the Engineer and his or her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his or her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

50-5 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his or her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join his or her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-6 CONSTRUCTION LAYOUT AND STAKES. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): **electronic CAD format (.dwg or .dgn).** In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not

concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking

b. Rough Grade slope stakes at 100-foot (30-m) stations

c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

d. Roadways – minimum three (3) per station

Base Course blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station

b. Taxiways – minimum three (3) per station

c. Holding apron areas – minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot (30-m) stations.

b. Between Lifts at 25-foot (7.5-m) stations for the following section locations:

(1) Runways – each paving lane width
(2) Taxiways – each paving lane width
(3) Holding areas – each paving lane width

c. After finish paving operations at 50-foot (15-m) stations:

(1) All paved areas – Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.

e. Fence lines at 100-foot (30-m) stations minimum.

f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach

Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.

g. Drain lines, cut stakes and alignment on 25-foot (7.5-m) stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).

i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet (120 m) per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

50-7 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-8 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors are authorized to notify the Contractor or his or her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for a decision.

50-9 INSPECTION OF THE WORK. All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform

to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection 70-14 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been established by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as established by the Engineer, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.
In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

50-14 PARTIAL ACCEPTANCE. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer may

accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 FINAL ACCEPTANCE. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60
CONTROL OF MATERIALS

60-1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection: **see construction drawings.**

60-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS. Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-3 CERTIFICATION OF COMPLIANCE. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, the Contractor shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-4 PLANT INSPECTION. The Engineer or his or her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-5 ENGINEER'S FIELD OFFICE. The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be

separate from any building used by the Contractor. The Contractor shall furnish photocopy machine, water, sanitary facilities, heat, air conditioning, wireless internet access and electricity The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable to the Engineer to inspect the workmanship and materials used into the work.

60-6 STORAGE OF MATERIALS. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property Owner's permission.
All storage sites on private or airport property shall be restored to their original condition by the Contractor at his or her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-7 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

60-8 OWNER FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-2 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-3 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-4 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated as follows:

Owner	*Person to Contact (Phone Number)*
Jefferson County (Jack Brooks Regional Airport	*Duke Youmans (409) 719-4900*
Federal Aviation Administration	*James Terrel*

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-5 FEDERAL AID PARTICIPATION. For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-6 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

70-7 PUBLIC CONVENIENCE AND SAFETY. The Contractor shall control his or her operations and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches high. Unless otherwise specified, barricades shall be spaced not more than 4 feet apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor's parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-9 USE OF EXPLOSIVES. When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to

complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below:

- Contractor shall reference the Construction Safety and Phasing Plan for phasing/beneficial occupancy requirements.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2 (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP). to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his or her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS. As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the

Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are indicated as follows:

- Contractor shall reference section 70-04 of the General Provisions for utility location information.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70- 04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his or her surety.

70-15.1 FAA FACILITIES AND CABLE RUNS. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport manager a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 NO WAIVER OF LEGAL RIGHTS. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 ENVIRONMENTAL PROTECTION. The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the

Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

SECTION 80
EXECUTION AND PROGRESS

80-1 SUBLETTING OF CONTRACT. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least **25** percent of the total contract cost.

Should the Contractor elect to assign his or her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

80-2 NOTICE TO PROCEED. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-3 EXECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-4 LIMITATION OF OPERATIONS. The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

- The contractor shall reference the Construction Safety and Phasing Plans for all phases of the work.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction (see Special Provisions).

80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION. All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

80-5 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition

that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-6 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his or her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-7 DETERMINATION AND EXTENSION OF CONTRACT TIME. The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

b. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal.

Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period, *as detailed in the Special Provisions*. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-8 FAILURE TO COMPLETE ON TIME. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted

sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
See Proposal and Contract		

The maximum construction time allowed for Schedules **[N/A]** will be the sum of the time allowed for individual schedules but not more than **[N/A]** days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-9 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his or her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason above, the Engineer shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be

liable and shall pay to the Owner the amount of such excess.

80-10 TERMINATION FOR NATIONAL EMERGENCIES. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his or her responsibilities for the completed work nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS. The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of **400** feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within **250** feet of an active runway at any time.

END OF SECTION 80

SECTION 90
MEASUREMENT AND PAYMENT

90-1 MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions. Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 lb (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-2 SCOPE OF PAYMENT. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-3 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-4 PAYMENT FOR OMITTED ITEMS. As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-5 PAYMENT FOR EXTRA WORK. Extra work, performed in accordance with the subsection 40-04 titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-6 PARTIAL PAYMENTS. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

When at least 95% of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-7 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-8 PAYMENT OF WITHHELD FUNDS. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-9 ACCEPTANCE AND FINAL PAYMENT. When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, and after the Engineer's receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances.

Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 CONSTRUCTION WARRANTY.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or
(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within 7 days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 30 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 PROJECT CLOSEOUT. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual.

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90

SECTION 100
CONTRACTOR QUALITY CONTROL PROGRAM

100-1 GENERAL. When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

a. Adequately provide for the production of acceptable quality materials.

b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.

c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

Paving projects over $250,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner's representative and the FAA prior to or at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

100-2 DESCRIPTION OF PROGRAM.

a. General description. The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. QUALITY CONTROL PROGRAM. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least **10** calendar days before the **associated work begins**. The Contractor's Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

a. Quality control organization

b. Project progress schedule

c. Submittals schedule

d. Inspection requirements

e. Quality control testing plan

f. Documentation of quality control activities

g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

100-3 QUALITY CONTROL ORGANIZATION. The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Program Administrator shall be a full-time on-site employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).

(5) Highway materials technician certified at Level III by NICET.

(6) Highway construction technician certified at Level III by NICET.

(7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. Quality control technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.

(2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.

(3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

100-4 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

100-5 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 INSPECTION REQUIREMENTS. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-7 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (for example, P-401)

b. Item description (for example, Plant Mix Bituminous Pavements)

c. Test type (for example, gradation, grade, asphalt content)

d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (for example, plant technician)

g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

100-8 DOCUMENTATION. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description
(2) Compliance with approved submittals
(3) Proper storage of materials and equipment
(4) Proper operation of all equipment
(5) Adherence to plans and technical specifications
(6) Review of quality control tests
(7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-9 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action

shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

100-11 NONCOMPLIANCE.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

(1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

END OF SECTION 100

SECTION 105 MOBILIZATION

105-1 DESCRIPTION. This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 POSTED NOTICES. Prior to commencement of construction activities the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-2 BASIS OF MEASUREMENT AND PAYMENT. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

END OF SECTION 105

SECTION 110
METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-1 GENERAL. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot values within the lot by using the following formula:

$$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$$

Where: X = Sample average of all sublot values within a lot
x_1, x_2 = Individual sublot values
n = Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2) / (n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot values in the set
d_1, d_2 = Deviations of the individual sublot values x_1, x_2,.. from the average value X
that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$
n = Number of sublots

f. For single sided specification limits (that is, L only), compute the Lower Quality Index Q_L by use of

the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with QL, using the column appropriate to the total number (n) of measurements. If the value of QL falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (that is, L and U), compute the Quality Indexes QL and QU by use of the following formulas:

$$Q_L = (X - L) / S_n$$

And

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit
P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project
Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60
A-2 = 97.55
A-3 = 99.30
A-4 = 98.35
n = 4

2. Calculate average density for the lot.

$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$
$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$
X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)2)) / (4 - 1)]^{1/2}$
$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$
$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

   $Q_L = (X - L) / S_n$
   $Q_L = (97.95 - 96.30) / 1.15$
   $Q_L = 1.4348$

5. Determine PWL by entering Table 1 with QL= 1.44 and n= 4.

   PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

   A-1 = 5.00
   A-2 = 3.74
   A-3 = 2.30
   A-4 = 3.25

2. Calculate the average air voids for the lot.

   $X = (x_1 + x_2 + x_3 \ldots x_n) / n$
   $X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
   $X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

   $S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$
   $S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$
   $S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

   $Q_L = (X - L) / S_n$
   $Q_L = (3.57 - 2.00) / 1.12$
   $Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and n = 4.

   PL = 97

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

   $Q_U = (U - X) / S_n$
   $Q_U = (5.00 - 3.57) / 1.12$
   $Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

   $P_U = 93$

8. Calculate Air Voids PWL

PWL = (P_L + P_U) - 100
PWL = (97 + 93) - 100 = 90

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project
Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

   A-3 = 99.30
   A-4 = 98.35
   A-2 = 97.55
   A-1 = 96.60

2. Use n=4 and upper 5% significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

   a. For measurements greater than the average:

      If (measurement - average) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier

      For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

      Since 1.174 is less than 1.463, the value is not an outlier.

   b. For measurements less than the average:

      If (average - measurement) / (standard deviation) is less than test criterion, then the measurement is not considered an outlier.

      For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

      Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

Less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420

96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566

43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

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SPECIAL PROVISIONS

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C-11 Contractor's Release and Affidavit
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SECTION A – FEDERAL AVIATION ADMINISTRATION REQUIREMENTS

A-01 GENERAL CIVIL RIGHTS PROVISIONS

The contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

This provision also obligates the tenant/concessionaire/lessee or its transferee for the period during which Federal assistance is extended to the airport through the Airport Improvement Program, except where Federal assistance is to provide, or is in the form of personal property; real property or interest therein; structures or improvements thereon.

In these cases the provision obligates the party or any transferee for the longer of the following periods:

(a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits; or
(b) the period during which the airport sponsor or any transferee retains ownership or possession of the property.

A-02 CIVIL RIGHTS – TITLE VI ASSURANCES

Title VI Solicitation Notice:
The Owner, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the **Title VI List of Pertinent Nondiscrimination Statutes and Authorities**, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

   a. Withholding payments to the contractor under the contract until the contractor complies; and/or

   b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

A-03 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein
.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   A. Timetables

   B. Goals for minority participation for each trade (Vol. 45 Federal Register pg. 65984 10/3/80)

   C. Goals for female participation in each trade (6.9%)

   These goals are applicable to all of the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor is also subject to the goals for both federally funded and non-federally funded construction regardless of the percentage of federal participation in funding.

   The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities

and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is the Jefferson County, Texas.

A-04 ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A-05 BUY AMERICAN CERTIFICATION

See Section 010470 "Bidder Certifications" for Contractor Buy American Certification.

A-06 DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

Prompt Payment (§26.29))- The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from Owner. The prime contractor agrees further to return retainage payments to each subcontractor within {specify the same number as above} days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

A-07 ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

A-08 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance

to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Federal Fair Labor Standards Act (29 USC 201)	U.S. Department of Labor – Wage and Hour Division

A-09 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the bidder or offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A-10 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities.

Requirement	Federal Agency with Enforcement Responsibilities
Occupational Safety and Health Act of 1970 (20 CFR Part 1910)	U.S. Department of Labor – Occupational Safety and Health Administration

A-11 RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this contract are subject to requirements and regulations issued by the FAA and the Sponsor of the Federal grant under which this contract is executed.

A-12 TRADE RESTRICTION CLAUSE

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;

c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001

A-13 VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference must be given to Vietnam era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns owned and controlled by disabled veterans as defined in Title 49 United States

Code, Section 47112. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

A-14 COPELAND "ANTI-KICKBACK" ACT

The United States Department of Labor Wage and Hours Division oversees the Copeland "Anti-Kickback" Act requirements. All contracts and subcontracts must meet comply with the Occupational Safety and Health Act of 1970.

United States Department of Labor Wage and Hours Division can provide information regarding any specific clauses or assurances pertaining to the Copeland "Anti-Kickback" Act requirements required to be inserted in solicitations, contracts or subcontracts.

A-15 DAVIS-BACON LABOR PROVISIONS

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent

by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2 Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the

contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;
(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or

indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize

apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts.

The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

A-16 TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the Contractor must promote policies and initiatives for employees and other work personnel that decrease crashes by distracted drivers, including policies to ban text messaging while driving. The Contractor must include these policies in each third party subcontract involved on this project.

A-17 EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and

applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the

administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 18.7a through 18.7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract

Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the

company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such a superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (18.7a through 18.7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 18.7a through 18.7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith

effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 18.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A-18 NOTICE OF NONSEGREGATED FACILITIES REQUIREMENT

Notice to Prospective Federally Assisted Construction Contractors:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the

forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities:

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause.

3. The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

A-19 TERMINATION OF CONTRACT

a. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services must be immediately discounted (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.

b. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price will be made, but no amount will be allowed for anticipated profit on unperformed services.

c. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor is liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.

d. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination will be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price will be made as provided in paragraph 2 of this clause.

e. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

A-20 CERTIFICATE REGARDING DEBARMENT AND SUSPENSION

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

CERTIFICATION REGARDING DEBARMENT AND SUSPENSION (SUCCESSFUL BIDDER REGARDING LOWER TIER PARTICIPANTS)

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov

2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.

3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

A-21 BREACH OF CONTRACT

Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

A-22 CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

2. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued thereunder;

3. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;

4. To include or cause to be included in any construction contract or subcontract which exceeds $100,000 the aforementioned criteria and requirements.

A-23 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2 .Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 above, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 above.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 above.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

SECTION B – STATE TERMS AND CONDITIONS

B-01 NOT USED

SECTION C – LOCAL TERMS AND CONDITIONS

C-01 CONTRACTOR'S INSURANCE

Contractor shall obtain insurance of the types and in the amounts described below. The insurance shall be written by insurance companies and on forms acceptable to Owner.

Owner and Garver, LLC shall be included as an insured under the CGL, (using ISO Additional Insured Endorsement CG 20 10 11 85 or a substitute providing equivalent coverage), and under the commercial automobile liability (using ISO Additional Insured Endorsement CA 2048 or a substitute providing equivalent coverage), and commercial umbrella, if any. This insurance, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Commercial General and Umbrella Liability Insurance: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than $5,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to the Project.

CGL insurance shall be written on ISO occurrence form CG 20 10 (11-85) (or a substitute combination of the following forms CG 20 10 (10-01) and CG 20 37 (10-01) providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury and liability assumed under an insured contract.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or amending the contractual coverage in the ISO occurrence form.

CGL insurance shall be written with an ISO form CG 25 03 05 09 Designated Construction Project(s) General Aggregate Limit or a substitute form providing equivalent coverage.

Continuing CGL Coverage: Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance, with a limit of not less than $5,000,000 each occurrence for at least 3 years following substantial completion of the Work.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed Work equivalent to that provided under ISO form CG 00 01.

Owner's and Contractor's Protective Liability Insurance: Contractor shall maintain Owner's and Contractor's Protective Liability (OCP) insurance on behalf of Owner and Garver, LLC, as named insured, with a limit of $1,000,000.

Railroad Protective Liability Insurance: Not applicable.

Commercial Auto and Umbrella Liability Insurance: Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than $1,000,000 each accident.

Such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos).

Commercial auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

If the Contract Documents require Contractor to remove and haul hazardous waste from the Project site, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under the ISO Pollution Liability-Broadened Coverage for Covered Autos Endorsement (CA 99 48) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

Workers' Compensation Insurance: Contractor shall maintain workers' compensation and employer's liability insurance.

1 Definitions:

1.1 **Certificate of coverage ("Certificate")** – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement, DWC-81, DWC-82, DWC-83, or DWC-84 showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

1.2 **Duration of the project** – Includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

1.3 **Persons providing services on the project ("subcontractor") in article 406.096** – Includes all persons or entities performing all or part of the services under the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractor, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" includes, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

2 The Contractor shall provide coverage, based on proper reporting of classification code and payroll amounts and filing any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – refer to Contractor's Insurance requirements above.

4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

5 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

5.1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

5.2 No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the project.

6 The Contractor shall retain all required certificates of coverage for the duration of the project and for one (1) year thereafter.

7 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

8 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

9 The Contractor shall contractually require each person with whom it contracts to provide services on a project to:

9.1 Provide coverage, based on reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all its employees providing services on the project, for the duration of the project.

9.2 Provide to the Contractor, prior to that person beginning work on the project a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

9.3 Provide the Contractor, prior to the end of coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

9.4 Obtain from each person with whom it contracts, and provide to the Contractor:

9.4.1 A certificate of coverage, prior to the other person beginning work on the project; and

9.4.2 the coverage period, if the coverage period shown on the current certificate of a new certificate of coverage showing extension of coverage, prior to the end of coverage ends during the duration of the project.

9.5 Retain all required certificates of coverage on file for the duration of the project and for one (1) year thereafter.

9.6 Notify the governmental entity in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

9.7 Contractually require each person with whom it contracts to perform as required by paragraphs 1. – 7. with the certificates of coverage to be provided to the person for whom they are providing services.

10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the contractor who will provide services of the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

The employer's liability, and if necessary commercial umbrella, limits shall not be less than $500,000 each accident for bodily injury by accident or $500,000 each employee for bodily injury by disease.

If Contractor leases its employees, the alternate employer endorsement (WC 00 03 01 A) shall be attached showing Owner in the schedule as the alternate employer.

Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy.

Where applicable, Nonappropriated Fund Instrumentalities Act (NFIA) shall be attached to the policy. NFIA extends the coverage of the Longshore and Harbor Workers' Compensation Act to civilian employees working on United States military bases throughout the world who are not paid with funds appropriated by Congress. These employees, working in facilities operated for the comfort, contentment, and improvement of armed forces personnel, are instead compensated with funds generated from earnings of their facility.

Where applicable, Outer Continental Shelf Lands Act Endorsement shall be attached to the policy.

Where applicable, the Maritime Coverage Endorsement shall be attached to the policy.

If project is located in a state where workers compensation is secured via monopolistic state funds, include evidence of the "Stop Gap" endorsement to the general liability policy.

Property Insurance: If applicable, Contractor shall purchase and maintain property insurance for the Work. Such insurance shall be written in an amount at least equal to the initial contract sum as well as subsequent modifications of that sum. The insurance shall apply on a replacement cost basis. If the insurance obtained in compliance with this paragraph is builders risk insurance, coverage shall be written on a completed value form.

The property insurance as required above shall name as insureds the Owner, Contractor, and all subcontractors and sub-subcontractors on the Project.

Primary and Non-contributory: Contractor agrees that the insurance listed above, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, Owner.

Waiver of Subrogation: Contractor waives all rights against the Owner and Garver, LLC and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability, commercial umbrella liability insurance, automobile liability insurance and workers compensation insurance maintained pursuant to paragraph C-01 of this agreement.

No Implied Waiver: Contractor shall furnish certifications matching the coverage requirements. Failure of Owner or Engineer to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner or Engineer to identify a deficiency from evidence that is provided shall not be construed as a waiver of the contractors obligations to furnish and maintain such insurance, or as a waiver to the enforcement of any of the provisions at a later date.

Any waiver of the contractor's obligation to furnish such certificate or maintain such evidence must be by written change order and signed by a Managing Member (Officer) of the Engineer and the Owner.

Cancellation, Non-Renewal, and/or Impairment Notification: The Contractor shall not cause any insurance policy to be cancelled or permit it to lapse and all insurance policies shall include an endorsement to the effect that the insurance policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance until notice has been mailed to the Owner and Engineer, stating the date when such cancellation or reduction shall be effective, which

date shall not be less than (60) days after such notice.

The amount shown in the bid item for the Owner's Protective Insurance shall include that amount of additional premium required for obtaining Owner's and Engineer's Protective Liability insurance for the Owner and Garver, LLC. The Engineer has the right to request justification from the contractor for the full amount of the cost included under the items "Owner's Protective Insurance".

Notice shall be sent via email and regular mail to the following persons and addresses:

Owner:
Alex Rupp
5000 Jerry Ware Drive
Beaumont, TX 77705
ARupp@co.Jefferson.tx.us

Garver:
Thomas Dodson, PE
Garver, LLC
12141 Wickchester
Suite 640
Houston, TX 77079
TDDodson@GarverUSA.com

C-02 UTILITIES

All work in this contract shall be in accordance with the Texas Underground Facilities Damage Prevention Act. The Contractor shall abide by the most current edition of this Act.

Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown.

The Contractor shall be responsible for the protection of all existing utilities or improvements crossed by or adjacent to his construction operations. Where existing utilities or service lines are cut, broken, or damaged, the Contractor shall replace or repair immediately the utilities or service lines with the same type of original material and construction or better, at his own expense.

C-03 LEGAL HOLIDAYS

Holidays that shall be observed are the following: New Year's Day (January 1); Memorial Day (last Monday in May); Independence Day (July 4); Labor Day (1st Monday in September); Thanksgiving Day (4th Thursday in November); and Christmas Day (December 25); no other days will be so considered. If a holiday falls on a Saturday or Sunday, the observed day shall be the Friday preceding the Saturday or the Monday following the Sunday. No construction observation will be furnished on legal holidays or Sundays, except in an emergency. The Contractor shall observe these legal holidays and all Sundays, and no work shall be performed on these days except in an emergency. Calendar day contract time includes delays for all holidays. Refer to Section C-06 for more information.

C-04 CLEAN UP

From time to time, the Contractor shall clean up the site, including any work areas at the airport, in order that the site presents a neat appearance and the progress of the work not be impeded. One such period of clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary plant, equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

C-05 PROJECT MEETINGS AND COORDINATION

A preconstruction conference will be called by the Engineer at a time convenient to the Owner and before the issuance of the "Notice to Proceed". The Engineer and the Contractor and such subcontractors as the Contractor may desire shall attend this meeting with the Owner.

The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this Contract. The Contractor shall attend all such conferences. This in no way relieves the Contractor of his responsibility to fully coordinate his work under this Contract.

C-06 LIQUIDATED DAMAGES FOR DELAY

The number of calendar days allowed for completion of the project is stipulated in the Proposal and in the Contract and shall be known as the Contract Time. The Contractor agrees that time is a critical element for this Contract. Loss will accrue to the Owner due to delayed completion of the work; and the cost to the Owner of the administration of the Contract, including engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The Contractor agrees that for each day of delay beyond the number of calendar days herein agreed upon for the completion of the work herein specified and contracted for, the Owner may withhold, permanently, from the Contractor's total compensation, the sum of **One**

Thousand Dollars (**$1,000.00**) as stipulated damages for each day of such delay. Should the amount otherwise due the Contractor be less than the amount of such ascertained and liquidated damages, the Contractor and his Surety shall be liable to the Owner for such deficiency.

It is understood and agreed by and between the Owner and the Contractor that the time of completion herein set out is a reasonable time. The Contractor shall perform fully, entirely, and in an acceptable manner, the work contracted for within the contract time stated in the Contract. The contract time shall be counted from ten days after the effective date of the "Notice to Proceed", or the date work commences, whichever occurs first; and shall include all Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of any orders of the Engineer for suspension of the prosecution of the work, due to the fault of the Contractor, shall be counted as elapsed contract time, and shall not be considered for an extension of time.

Extensions of time for completion, under the condition of 3(a) next below, will be granted; extensions may be granted under other stated conditions:

1. If the satisfactory execution and completion of the Contract shall require work or material in greater amounts or quantities than those set forth in the Contract, then the Contract time shall be increased in the same proportion as the additional work bears to the original work contracted for.

2. An average or usual number of inclement weather days, when work cannot proceed, is to be anticipated during the construction period and is not to be considered as warranting extension of time. The days included in the contract time for Normal Weather-Related Events and holidays are as follows:

(On A Monthly Basis)

Month	Normal Weather-Related Events
January	5
February	7
March	4
April	4
May	3
June	4
July	8
August	4
September	6
October	5
November	2
December	5

If, however, it appears that the Contractor is delayed by conditions of weather, outside of normal weather-related events detailed in the proceeding table, extensions of time may be granted.

3. Should the work under the Contract be delayed by other causes which could not have been prevented or contemplated by the Contractor, and which are beyond the Contractor's power to prevent or remedy, an extension of time may be granted. Such causes of delay shall include but not necessarily be limited to the following:

   a. Acts of God, acts of the public enemy, acts of the Owner except as provided in these Specifications, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather.

b. Any delays of Subcontractors or suppliers occasioned by any of the causes specified above.

The Engineer or other authorized representative of the Owner shall keep a written record sufficient for determination as to the inclusion of that day in the computation of Contract time. This record shall be available for examination by the Contractor during normal hours of work as soon as feasible after the first of each construction month. In case of disagreement between the representative of the Owner and the Contractor, as to the classification of any day, the matter shall be referred to the Owner whose decision shall be final.

If the Contractor finds it impossible for reasons beyond his control to complete the work within the Contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the Contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may recommend to the Owner that the contract time be extended as conditions justify. If the Owner extends the contract, the extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

The amount of all extensions of time for whatever reason granted shall be determined by the Owner. In general, only actual and not hypothetical days of delay will be considered. The Owner shall have authority to grant additional extensions of time as the Owner may deem justifiable.

C-07 QUALITY ASSURANCE/MATERIALS TESTING

The Owner shall be responsible for quality assurance testing as stated in theses specifications; however, the Contractor shall be responsible for payment of any subsequent tests made necessary by previous unsatisfactory tests. In this event, the Owner's quality assurance representative shall conduct the additional testing and payment for such tests shall be directly deducted from the Contractor's payment. The Contractor shall pay for additional testing at the Owner's contract rate.

C-08 RECORD DOCUMENTS

The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, Shop Drawings and samples at the site, in good order, and annotated to show all changes made during the construction process. In addition, the Contractor shall note any differences between locations of underground existing facilities shown in the plans and the actual location located during construction. These record documents shall be available to the Engineer for examination and shall be delivered to the Engineer upon completion of the work.

C-09 CONTRACTOR/SUBCONTRACTOR/SUPPLIER LEGAL DISPUTES

Any fees, expenses, charges, fines or other costs borne by the Owner as a result of legal disputes or lawsuits between the contractor and his subcontractors, or between the contractor and his suppliers, shall be deducted from monies due or which may thereafter become due the contractor.

C-10 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the improvements embraced in this contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of final acceptance of the work. The Contractor will be responsible for all costs associated with construction observation and oversight for the repair work. The Owner will give notice of defective materials and work with reasonable promptness. In the event repair work is required, the

Contractor shall remedy any defects and pay for any damage to other work resulting there, which shall appear within a period of 12 months from the date of the acceptance of the repair work.

C-11 CONTRACTOR'S RELEASE AND AFFIDAVIT

At the project's completion, the Contractor shall execute the attached Release and Lien Waiver to release all claims against the Owner arising under and by virtue of his Contract. The date of the Release shall be that agreed to for the final acceptance of the project with the Owner.

C-12 SUBMITTALS

The Contractor shall prepare and submit information required by the individual Specification sections sufficiently in advance of the related work to allow an appropriate review time by the Engineer. The types of submittals are indicated in the individual Specification sections.

During the preconstruction conference, the Contractor shall review his submittal schedule and procedures, including notifying the Engineer whether electronic submittals or paper submittals will be provided for all submittal packages in the project. Mixing of package types will not be allowed. The Contractor shall provide one of the following submittal package types:

1. Submit electronic submittals via email as PDF electronic files directly to the Engineer's designated representative, or post these PDF electronic files directly to the Engineer's FTP site specifically established for this project. Electronic submittals shall be in Adobe Acrobat (*.PDF) format and shall be legible when printed.

2. Submit six (6) paper submittal copies via mail or other courier service to the Engineer's designated representative.

Submittals shall be neat, organized, and easy to interpret. Assemble complete submittal package into a single indexed electronic file or hard cover bound book, incorporating submittal requirements of an individual Specification section, the transmittal form with unique submittal numbering system, and electronic links or tabs enabling navigation to each item. Unless approved otherwise by the Engineer, all submittals for the individual Specification section shall be submitted at one time.

Submittals must come directly from the Prime Contractor; submittals from subcontractors or suppliers will not be reviewed.

Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Faxed submittals or submittals with extremely small or otherwise unreadable print will not be accepted. Submittals not required by the Contract Documents will be returned by the Engineer without action.

The Contractor shall retain complete copies of submittals on project site. Use only final submittals that are marked with approval notation from Engineer's submittal review stamp with comments form.

Resubmittals shall continue the unique, sequential, submittal numbering system. Resubmittals without unique numbering, example resubmittals transmitted as 005A or 005REV, are unacceptable and will be returned un-reviewed.

C-13 STORMWATER POLLUTION PREVENTION PLAN

Refer to Technical Specification P-156.

C-14 TEST BORINGS/SUBSURFACE INFORMATION

A geotechnical investigation and soils report have been completed for the project area and are available upon request. This information can be obtained by contacting the Engineer.

Soil characteristics provided in any soil reports, or as shown on boring logs, are representative only at the location of the sample taken, and neither the Owner, Engineer nor Engineer's consultants will be responsible for variations in the soil characteristics at other locations. Any subsurface information or geotechnical reports made available to Contractor was obtained and intended for the Owner's design and estimating purposes only. Such reports and drawings are not Contract Documents.

The Contractor may not rely upon or make any claim against Owner, Engineer, or Engineer's Consultants with respect to (1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor and safety precautions and programs incident thereto, (2) other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings, or (3) any Contractor interpretation or other conclusion drawn from any data, interpretations, opinions, or information.

If in any case, the recommendations set forth in the Geotechnical Report conflict with the requirements set forth in these Contract Documents, the requirements in the Contract Documents shall take precedent.

C-15 WAGE RATES

The Davis Bacon minimum wage rates for this project are applicable and included in Section L of this contract.

END OF SPECIAL PROVISIONS

RELEASE OF LIEN

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

DATE OF CONTRACT: _____

Upon receipt of the final payment and in consideration of that amount, the undersigned does hereby release the Owner and its agents from any and all claims arising under or by virtue of this Contract or modification thereof occurring from the undersigned's performance in connection with the

_____

_____

project.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20___.

_____
Notary Public

My Commission Expires:

_____

CONTRACTOR'S AFFIDAVIT

FROM: Contractor's Name _____

Address _____

TO: Owner's Name _____

Address _____

_____

DATE OF CONTRACT: _____

I hereby certify that all claims for material, labor, and supplies entered into contingent and incident to the construction or used in the course of the performance of the work on _____

_____

have been fully satisfied.

_____
Contractor's Signature

_____
Title

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____

The Surety Company consents to the release of the retained percentage on this project with the understanding that should any unforeseen contingencies arise having a right of action on the bond that the Surety Company will not waive liability through the consent to the release of the retained percentage.

Dated _____
Surety Company

By _____
Resident Agent, State of Texas

SECTION L
ADDENDA

INSERT ADDENDA HERE

SECTION M
WAGE RATES

Article 5159a of the Revised Civil Statutes of Texas, passed by the 43rd Legislature Acts of 1933, Page 91, Chapter 45, provides that any government subdivision shall ascertain the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft or type of workman or mechanic and shall specify in the call for bids and in the Contract the prevailing rate of per diem wages which shall be paid for each craft type of workman. This Article further provides that the CONTRACTOR shall forfeit, as a penalty, to the City, County, or State, or other political subdivision, Ten Dollars ($10.00) per day for each laborer, or workman, or mechanic who is not paid the stipulated wage for the type of work performed by him as set up on the wage scale. The OWNER is authorized to withhold from the CONTRACTOR, after full investigation by the awarding body, the amount of this penalty in any payment that might be claimed by the CONTRACTOR or Subcontractor. The Act makes the CONTRACTOR responsible for the acts of the Subcontractor in this respect.

The Article likewise requires that the CONTRACTOR and Subcontractor keep an accurate record of the names and occupations of all persons employed by him and show the actual per diem wages paid to each worker, and these records are open to the inspection of the OWNER.

The Davis Bacon minimum wage rates for this project are as follows:

LABOR CLASSIFICATION AND MINIMUM WAGE SCALE

General Decision Number: TX170056 01/06/2017 TX56

Superseded General Decision Number: TX20160056

State: Texas

Construction Type: Highway

Counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jefferson, Liberty, Montgomery, Orange, San Jacinto and Waller Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction;bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least$10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

* SUTX2011-013 08/10/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving and Structures)	$ 12.98	
ELECTRICIAN	$ 27.11	
FORM BUILDER/ FORM SETTER		
Paving & Curb	$ 12.34	
Structures	$ 12.23	
LABORER		
Asphalt Raker	$ 12.36	
Flagger	$ 10.33	
Laborer, Common	$ 11.02	
Laborer, Utility	$ 11.73	
Pipelayer	$ 12.12	
Work Zone Barricade Servicer	$ 11.67	
PAINTER (Structures)	$ 18.62	
POWER EQUIPMENT OPERATOR		
Asphalt Distributor	$ 14.06	
Asphalt Paving Machine	$ 14.32	
Broom or Sweeper	$ 12.68	
Concrete Pavement Finishing Machine	$ 13.07	
Concrete Paving, Curing, Float, Texturing Machine	$ 11.71	
Concrete Saw	$ 13.99	
Crane, Hydraulic 80 Tons or less	$ 13.86	
Crane, Lattice boom 80 tons or less	$ 14.97	
Crane, Lattice boom over 80 Tons	$ 15.80	
Crawler Tractor	$ 13.68	
Excavator, 50,000 pounds or less	$ 12.71	
Excavator, Over 50,000 pounds	$ 14.53	
Foundation Drill, Crawler Mounted	$ 17.43	
Foundation Drill, Truck Mounted	$ 15.89	
Front End Loader 3 CY or Less	$ 13.32	
Front End Loader, Over 3 CY	$ 13.17	
Loader/Backhoe	$ 14.29	
Mechanic	$ 16.96	
Milling Machine	$ 13.53	
Motor Grader, Fine Grade	$ 15.69	
Motor Grader, Rough	$ 14.23	
Off Road Hauler	$ 14.60	
Pavement Marking Machine	$ 11.18	
Piledriver	$ 14.95	
Roller, Asphalt	$ 11.95	
Roller, Other	$ 11.57	
Scraper	$ 13.47	
Spreader Box	$ 13.58	
Servicer.	$ 13.97	
Steel Worker		
Reinforcing Steel	$ 15.15	
Structural Steel Welder	$ 12.85	
Structural Steel	$ 14.39	
TRUCK DRIVER		
Low Boy Float	$ 16.03	
Single Axle	$ 11.46	
Single or Tandem Axle Dump	$ 11.48	
Tandem Axle Tractor w/Semi Trailer	$ 12.27	
WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.		

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union

average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- an existing published wage determination
- a survey underlying a wage determination
- a Wage and Hour Division letter setting forth a position on a wage determination matter
- a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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For current Wage Determination Decisions, see the Department of Labor website (http://www.wdol.gov/dba.aspx#0).

SECTION N
CHANGE ORDER FORM

Change Order

No. _____

Date of Issuance: Effective Date:
Project: Owner: Owner's Contract No.:
Contract: Date of Contract:
Contractor: Engineer's Project No.:

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments: (List documents supporting change):

CHANGE IN CONTRACT PRICE:
Original Contract Price:

CHANGE IN CONTRACT TIMES:
Original Contract Times:
☐ Working days ☐ Calendar days

Substantial completion (days or date):
$ Ready for final payment (days or date):
[Increase] [Decrease] from previously approved Change

Orders No._____ to No._____:

[Increase] [Decrease] from previously approved Change Orders
No._____ to No._____:

Substantial completion (days):

$ Ready for final payment (days):
Contract Price prior to this Change Order: Contract Times prior to this Change Order:

Substantial completion (days or date):

$ Ready for final payment (days or date):
[Increase] [Decrease] of this Change Order: [Increase] [Decrease] of this Change Order:
Substantial completion (days or date):

$ Ready for final payment (days or date):
Contract Price incorporating this Change Order: Contract Times with all approved Change Orders:

Substantial completion (days or date):
$ Ready for final payment (days or date):

RECOMMENDED:	ACCEPTED:	ACCEPTED:
_____	_____	_____
By:	By:	By:
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized signature)
_____	_____	_____
Date:	Date:	Date:

_____
Approved by Funding Agency (if applicable):

_____
Date:

SECTION O
TECHNICAL SPECIFICATIONS

ITEM SS-100 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP)

DESCRIPTION

100-1.1 This item includes notes in reference to construction safety and phasing for the project. This item shall be used in conjunction with all Construction Safety Drawings and Construction Safety and Phasing Notes in the plans.

CONSTRUCTION SAFETY AND PHASING NOTES

100-2.1 COORDINATION.

a. Contractor Progress Meetings - The Owner, Engineer, and Contractor will hold progress meetings on a coordinated schedule during construction. Operational safety will be a standing agenda item in such meetings.

b. Scope or Schedule Changes - The Owner and/or Engineer will call such coordination conferences as may seem expedient to him for the purpose of assuring coordination of the work covered by this contract and/or scope or schedule changes. The Contractor shall attend all such conferences.

c. –NOT REQUIRED-

100-2.2 PHASING. During performance of this project, the airport's runways, taxiways, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible. The project is phased to reduce operational impacts at the airport.

a. Phase Elements – If necessary for each phase, the construction safety drawings detail the areas closed to aircraft operations, estimated duration of closures, taxi routes, ARFF access routes, construction staging areas, construction access and haul routes, NAVAID impacts, lighting and marking changes, available runway length, declared distances, hazard marking and lighting, and required lead time for NOTAMS.

b. Construction Safety Drawings – See sheets G-301 through G-305 of the construction plans for construction safety drawings.

100-2.3 AREAS OF OPERATIONS AFFECTED BY CONSTRUCTION ACTIVITY.

a. Identification of Affected Areas – See the table below and the construction safety drawings for areas affected by construction for each phase.

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12-30 ARC	C-III	Same	Same	Same
Runway 12 Approach Minimums	½ Mile	Same	Same	Same
Runway 30 Approach Minimums	¾ Mile	Same	Same	Same
Runway 12 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same

Operational Requirement	Existing Condition	Phase 1	Phase 2	Phase 3
Runway 12 Declared Distances	ASDA: 6,675	Same	Same	Same
	LDA: 6,675	Same	Same	Same
Runway 30 Declared Distances	TORA: 6,750	Same	Same	Same
	TODA: 6,750	Same	Same	Same
	ASDA: 6,750	Same	Same	Same
	LDA: 6,750	Same	Same	Same
Runway 12 Approach Procedures	ILS/RNAV/VOR	Same	Same	Same
Runway 30 Approach Procedures	RNAV/LPV	Same	Same	Same
Runway 12 NAVAIDS	MALSR, DME	Same	Same	Same
Runway 30 NAVAIDS	PAPI	Same	Same	Same
Taxiway D ARC	ADG-III / TDG-V	ADG-III / TDG-III	ADG-III / TDG-III	ADG-III / TDG-III

b. Mitigation Efforts - See the table above and the construction safety drawings for mitigation efforts of operations affected by construction.

100-2.4 PROTECTION OF NAVIGATION AIDS (NAVAIDS). The Contractor must not conduct any construction activity within navigational aid restricted areas without prior approval from the local FAA Airway Facilities Sector representative. Navigational aids include instrument landing system components and very high-frequency omni-directional range airport surveillance radar. Such restricted areas are depicted on the construction safety drawings.

100-2.5 CONTRACTOR ACCESS.

a. Location of Stockpiled Materials - The Contractor may install a temporary fence around his construction staging area to separate his material stockpile, equipment storage, and parking areas from the public. No personal vehicles of contractor's employees will be allowed inside the secured area of the airport. All material deliveries shall be received in the staging area reserved by the contractor. No delivery trucks will be allowed access to a secured area of the airport beyond this staging area. Stockpiled materials and equipment are not permitted within the active runway safety area and obstacle free zone. The contractor shall receive approval from the Engineer and FAA air spacing office prior to locating stockpiles or equipment within the object free area, safety area, or obstacle free zone. No stockpile shall be greater than 15-ft in height.

b. Vehicle and Pedestrian Operations - See the construction safety drawings for construction site parking, equipment storage areas, and access and haul routes. Vehicular traffic shall always yield to aircraft traffic.

When any vehicle, other than one that has prior approval from the airport operator, must travel over any portion of an aircraft movement area, it will be escorted and properly identified. To operate in those areas during daylight hours, the vehicle must have a flag or beacon attached to it. Any vehicle operating on the

movement areas during hours of darkness or reduced visibility must be equipped with a flashing dome-type light, the color of which is in accordance with local or state codes.
All construction vehicles shall be clearly identified for control purposes by prominently displaying the company name on each side of the vehicle. The identification symbols should be a minimum 8-inch block-type characters of a contrasting color and easy to read. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable.

At 14 CFR Part 139 certified and towered airports, all vehicle operators having access to the active parts of the airfield must be familiar with airport procedures for the operation of ground vehicles and the consequences of noncompliance or be escorted by someone who is. Those trained must provide a certificate of training to the airport prior to accessing the airfield. Only those trained and providing a certificate as such will have escorting privileges.

Personnel entering the active parts of the airport must be in possession of and display a valid airport identification badge at all times or must be escorted by a person with the above-noted escorting privileges. Any person who is escorting individuals must be in direct control of the escorted individuals at all times. Any fine, including any and all associated costs, assessed the airport for failure to maintain security of the airport which are a result of the negligence of the prime contractor, any of his subcontractors, or any supply/delivery personnel, will be assessed to the prime contractor and shall be deducted from any monies due him.

Vehicular traffic located in or crossing an active movement area must have a working two-way radio in contact with the control tower or be escorted by a person in radio contact with the tower. The driver, through personal observation, should confirm that no aircraft is approaching the vehicle position. Construction personnel may operate on the airfield without two-way radio communication provided a NOTAM is issued closing the area and the area is properly marked to prevent incursions. Two-way radio communications are required between Contractor personnel and the Airport Traffic Control Tower/Airport Aeronautical Advisory Stations "Beaumont Ground" (119.50MHz) between the hours of 06:00 and 22:00; and UNICOM (122.95MHz) between the hours of 22:00 and 06:00 daily. Continuous monitoring is required only when equipment movement is necessary in certain areas.

c. Control of Gates - The Contractor shall be responsible for maintaining the security of the access gates by keeping the access gate locked or guarded at all times. Should the Contractor fail, at any time, to keep the access gate locked or guarded, there shall be a fine of $200.00 assessed to the Contractor, for each occurrence that the Contractor fails to maintain the security of the access gate. All fines assessed to the Contractor shall be deducted from any monies due to him/her.

100-2.6 WILDLIFE MANAGEMENT. The Contractor shall review AC 150/5200-33, hazardous wildlife attractants on or near airports, and CertAlert 98-05, grasses attractive to hazardous wildlife (www.faa.gov). The Contractor shall carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports. The contractor shall mitigate the following items.

a. Trash - The Contractor shall perform trash clean-up on a daily basis.

b. Standing Water - The Contractor provide temporary drainage during construction to avoid standing water.

c. Tall Grass and Seeds - The Contractor shall adhere to the requirements of Section T-901, Seeding of the contract documents and specifications.

d. Poorly Maintained Fencing and Gates - The Contractor shall immediately report any damage to gates or fences. The Contractor will be responsible for repairs to any gates or fences caused by negligence by the Contractor.

e. Disruption of Existing Wildlife Habitat - The Contractor shall notify the airport immediately of any wildlife sightings.

100-2.7 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT.

The Contractor shall ensure that the pavement surfaces in the active movement area are kept clean from dirt, mud, and other debris from the Contractor's equipment. Frequent clean up in the vicinity of Contractor's work areas is required.

The Contractor shall require vehicle operators to check tires prior to traversing active airfield pavement. Any material tracked onto an active airfield pavement by construction equipment shall be immediately removed. See AC 150/1510-24, foreign object debris (FOD) management (www.faa.gov) for further instruction.

100-2.8 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT.

If any construction vehicle or equipment is operated within airport property, the Contractor must be adequately prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks. Special care must also be taken when handling or transporting hazardous materials on airport property. The contractor shall notify the Engineer immediately after any hazardous material spill. Management of hazardous wastes must strictly follow the most current stringent Federal, State and local regulations governing treatment, storage, and disposal. See AC 150/5320-15, management of airport industrial waste (www.faa.gov), for further instruction.

100-2.9 NOTIFICATION OF CONSTRUCTION ACTIVITIES.

a. List of Responsible Representatives - A point of contact list will be completed as part of ITEM SS-101 Safety Plan Compliance Document (SPCD) and will be delivered to all parties prior to construction.

b. Notices to Airmen (NOTAM) - Before beginning any construction activity, the Contractor must, through the airport operator, give notice using the NOTAM system of proposed location, time, and date of commencement of construction. Upon completion of work and return of all such areas to standard conditions, the Contractor must, through the airport operator, verify the cancellation of all notices issued via the NOTAM system giving a 72 hour (weekdays) advance notice.

c. Emergency Notification Procedures - In the event of an emergency, the Contractor shall call airport emergency response 719-4950; and 911. Contractor is to also immediately notify the Engineer.

d. Coordination with ARFF personnel - Any deactivation of water lines or hydrants, rerouting of access routes, or use of hazardous materials on the airfield shall be coordinated and approved by the airport's ARFF personnel prior to execution of such activities.

e. Notification to the FAA - The Contractor shall ensure, through the Engineer, that all construction equipment over 25-ft in height is air spaced through the appropriate FAA regional or district office prior to using such equipment on site.

Shutdown of any NAVAID (airport or FAA owned) shall be coordinated with the FAA ATO 45 days prior to the proposed shutdown. The Contractor shall provide an additional seven days advance notice to the airport to coordinate with the FAA ATO Tech Ops office responsible for the FAA facilities.

100-2.10 INSPECTION REQUIREMENTS.

a. Daily Inspections - The Contractor shall perform daily safety inspections to ensure all construction operations are in conformance with the CSPP.

b. Final Inspections - Prior to opening any portion of the airport to traffic, the Contractor, Engineer, and airport operator shall perform a safety inspection of the area to be opened to traffic to ensure conformance with the CSPP and FAA standards.

100-2.11 UNDERGROUND UTILITIES. Underground utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these utilities on the plans. However, all existing utilities may not be shown and the actual locations of the utilities may vary from the locations shown. Prior to beginning any type of excavation, the contractor shall contact the utilities involved and make arrangements for the location of the utilities on the ground. The contractor shall maintain the utility location markings until they are no longer necessary.

Texas state law, the underground facilities damage prevention act, requires ten working days advance notification through the one-call system center before excavating using mechanized equipment or explosives (except in the case of an emergency). The one-call system phone number is 1-800-245-4848, or 811. The contractor is advised that there is a severe penalty for not making this call. Not all utility companies are members of the one-call system; therefore, the contractor is advised to contact all non-member utilities as well as the one-call system.

Due to FAA underground cables being located in the areas depicted in the plans, the contractor shall use extreme caution when working in these areas. The Contractor shall notify FAA ATO Ops personnel a minimum of 10 days prior to construction in these areas to ensure no FAA utilities will be impacted. Any FAA equipment or utilities damaged during construction shall be replaced by the contractor at no expense to the owner or the FAA.

100-2.12 PENALTIES. Failure of the Contractor (including employees) or any of his subcontractors (including employees) to comply with ATCT instructions, the airport safety plan, or any of the other requirements of the airport while operating on airport property, shall be subject to the following:

a. First Offense - The Contractor shall receive a fine of $1,000.00, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fines or penalties imposed on the airport as a result of the incident will be assessed to the Contractor.

b. Second Offense - The Contractor shall receive a fine of $5,000.00 to be deducted from any monies due him, and the vehicle operator will receive a loss of driving privileges on the airport. In addition, any fine or penalties imposed on the airport as a result of the incident will be assessed to the contractor.

c. Third Offense - Work will be suspended. The Contractor (including employees) and any of his subcontractors (including employees) who will operate ground vehicles on the airport shall successfully complete, for a second time, formalized airport safety training, to be conducted by airport staff. When the contractor's employees have completed airport safety training to the satisfaction of the owner, work may continue at the discretion of the Owner.

100-2.13 RUNWAY AND TAXIWAY VISUAL AIDS.

a. General - All airport markings, lighting, signs, and visual NAVAIDs that are in operation must be clear from all obstructions. All temporary markings, signs, lights, or other visual aids must be secured in place to prevent prop wash, jet blast, wing vortices, or other wind currents.

b. Markings - All temporary or permanent runway and taxiway visual aids shall conform to the requirements of the most recent edition of FAA AC 150/5340-1 (www.faa.gov). Markings for this project include the following:

i. Temporarily Closed Taxiways – The Contractor shall be responsible for furnishing, installing, and maintaining taxiway closure markers at the entrance to the closed taxiway from the adjacent runway. The taxiway closure markers shall be installed inside the runway safety area. The

contractor shall also furnish and install low profile barricades at the entrance to the closed taxiway from an adjacent taxiway. Barricades shall be installed outside all active taxiway safety areas. See details on construction safety drawings for closed taxiway marker and low-profile aircraft barricade details.

c. Lighting and Visual Aids – All temporary lighting for runway and taxiway systems shall conform to the requirements of the most recent edition of FAA AC 150/5340-30 and 150/5345-50 (www.faa.gov). The contractor shall be responsible for disconnecting isolation transformers associated with any runway or taxiway light fixtures that are being disconnected.

d. Signs - The Contractor shall install all signs in accordance with the most recent edition of FAA AC 150/5345-44 and 150/5340-18. Any sign that is not performing its normal function must be covered or removed to prevent misleading pilots.

100-2.14 MARKING AND SIGNS FOR ACCESS ROUTES. The contractor shall be responsible for supplying and installing all necessary markings and signage for all access routes to and from the site to be used by contractor personnel, subcontractor personnel, or delivery operations. All signage in the air operations area shall be frangible mounted.

100-2.15 HAZARD MARKING AND LIGHTING

a. Purpose - Hazard marking and lighting prevents pilots from entering areas closed to aircraft and prevents contractor personnel from entering areas open to aircraft.

b. Equipment - The contractor shall furnish, install, and maintain low-profile barricades in hazardous areas inside movement areas. Barricades shall restrict access and make hazards obvious to aircraft, personnel, and vehicles. During periods of low visibility and at night, barricades shall be equipped with red flashing or steady burning lights. The spacing of barricades shall be such that a breach is physically prevented barring a deliberate act. If barricades are intended to prevent pedestrians, then they shall be linked. See details on construction safety drawings for low-profile aircraft barricade detail.

100-2.16 PROTECTION OF SAFETY AREAS, OBJECT FREE AREAS, OBJECT FREE ZONES, AND APPROACH/DEPARTURE SURFACES:

a. Runway Safety Areas (RSA) - No work shall be permitted within an active RSA. If required, adjustments to the RSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. The Contractor shall insure adequate distance protection for blast projection, as needed. All open trenches or excavations within the limits of the RSA shall be back filled or covered prior to opening the runway to operations. In addition, erosion control measures shall be provided in the RSA to prevent ruts, humps, or depressions inside the limits of the RSA.

b. Runway object free areas (ROFA) - No material shall be stockpiled inside the limits of the active ROFA unless approved by air spacing through the appropriate FAA airports regional or district office.

c. Taxiway safety areas (TSA) - No work shall be permitted within an active TSA. If required, adjustments to the taxiway TSA dimensions through restricted operations shall be coordinated with the FAA airports regional or district office prior to construction. All open trenches or excavations within the limits of the TSA shall be back filled or covered prior to opening the taxiway to operations. In addition, erosion control measures shall be provided in the TSA to prevent ruts, humps, or depressions inside the limits of the TSA.

d. Taxiway Object Free Areas (TOFA) - No construction shall be permitted inside an active TOFA unless the taxiway has been restricted to operations requiring a TOFA equal to that of the TOFA available. If required, construction may be permitted inside the TOFA if the taxiway centerline markings are offset with centerline reflectors or lighting, or appropriate NOTAMs are issued. Construction may also be permitted inside the TOFA if a five foot wing tip clearance is maintained for all construction equipment

and vehicles. In this scenario, flaggers and wing walkers must be used to direct traffic through the construction site.

e. Obstacle Free Zone (OFZ) - No personnel, material, or equipment shall penetrate the OFZ while the runway is open to operations. The dimensions of the OFZ are as defined in FAA AC 150/5300-13 (www.faa.gov).

f. Approach/Departure Surfaces - All contractor personnel, materials, and equipment shall remain clear of the applicable threshold siting surfaces as defined in Chapter 3 of FAA AC 150/5300-13 (www.faa.gov). Construction activities that require penetration into the threshold siting surface shall be accomplish through displacing or partially closing the runway. Such construction activities shall require coordination with the FAA airports regional or district office.

100-2.17 OTHER LIMITATIONS ON CONSTRUCTION

a. Prohibitions - The use of equipment (i.e. cranes, concrete pumps) over 35 feet in height shall not be used unless approved by the engineer and proper coordination for FAA aeronautical study is completed. The submittal for this coordination shall take place at least 45 days prior to anticipated use.

Open flame welding and torch cutting operations are not permitted unless adequate fire safety precautions are provided and these operations are authorized by the airport operator and the engineer.

Electrical blasting caps shall not be permitted within 1,000-ft of the airport property. Flare pots are not permitted within the air operations area.

MEASUREMENT AND PAYMENT

100-3.1 Adherence to the requirements of the CSPP will not be measured for separate payment.

END OF ITEM SS-100

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ITEM SS-101 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

DESCRIPTION

101-1.1 The contractor shall thoroughly review the approved Construction Safety and Phasing Plan (CSPP) and shall comply with approved CSPP. The contractor shall certify such compliance by completing the attached SPCD and submitting to the Engineer for approval.

Contractor Safety Plan Compliance Documents

Owner Name: Jefferson County

Airport: Jack Brooks Regional Airport

Project Description: Taxiway 'D' Reconstruction (2017)

Contractor: _____

Each item listed below corresponds to a specific section of the approved CSPP. The contractor shall certify that he/she will comply with each section of the approved CSPP. Each certified section with a "no" response must be fully explained in an attachment to the SPCD. The document shall be signed and dated by a principle or owner in the Contractor's company. All other requested information shall be completed by the Contractor and submitted to the Engineer for approval as part of the SPCD.

1. **Section 1 - Correspondence:** This project shall be completed in accordance with Section 1 "Coordination" of the approved Construction Safety Plan Compliance Document.

Owner:	
Contact: Alex Rupp, Airport Manager	**Phone:** 409-719-4900
Engineer:	
Project Manager: Tom Dodson	**Phone:** 713-491-8333
Project Engineer: Javier Suarez	**Phone:** 713-491-8333
Construction Observer: Steve Escagne	**Phone:** 972-951-8234
Materials Testing: Liana Collier	**Phone:** 409-377-4991
Contractor:	
Project Manager:	**Phone:**
Superintendent:	**Phone:**
Subcontractors:	
LIST ALL SUBS	

Yes_____No *

2. **Section 2 - Phasing:** This project shall be completed in accordance with Section 2 "Phasing" of the approved Construction Safety Plan Compliance Document.

Yes_____No *

3. **Section 3 – Areas of Operations Affected by Construction Activity:** This project shall be completed in accordance with Section 3 "Areas of Operations Affected by Construction Activity" of the approved Construction Safety Plan Compliance Document.

Yes_____No *

4. **Section 4 – Protection of Navigational Aids (NAVAIDS):** This project shall be completed in accordance with Section 4 "Protection of Navigational Aids (NAVAIDS)" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

5. **Section 5 – Contractor Access:** This project shall be completed in accordance with Section 5 "Contractor Access" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

6. **Section 6 – Wildlife Management:** This project shall be completed in accordance with Section 6 "Wildlife Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

7. **Section 7 – Foreign Object Debris (FOD) Management:** This project shall be completed in accordance with Section 7 "Foreign Object Debris (FOD) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

8. **Section 8 – Hazardous Materials (HAZMAT) Management:** This project shall be completed in accordance with Section 8 "Hazardous Materials (HAZMAT) Management" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

9. **Section 9 – Notification of Construction Activities:** This project shall be completed in accordance with Section 9 "Notification of Construction Activities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

10. **Section 10 – Inspection Requirements:** This project shall be completed in accordance with Section 10 "Inspection Requirements" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

11. **Section 11 – Underground Utilities:** This project shall be completed in accordance with Section 11 "Underground Utilities" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

12. **Section 12 – Penalties:** This project shall be completed in accordance with Section 12 "Penalties" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

13. **Section 13 – Special Conditions:** This project shall be completed in accordance with Section 13 "Special Conditions" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

14. **Section 14 – Runway and Taxiway Visual Aids**: This project shall be completed in accordance with 14 "Runway and Taxiway Visual Aids" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

15. **Section 15 – Marking and Signs for Access Routes:** This project shall be completed in accordance with Section 15 "Marking and Signs for Access Routes" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

16. **Section 16 – Hazard Marking and Lighting:** This project shall be completed in accordance with Section 16 "Hazard Marking and Lighting" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

17. **Section 17 – Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces:** This project shall be completed in accordance with Section 17 "Protection of Safety Areas, Object Free Areas, Object Free Zones, and Approach / Departure Surfaces" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

18. **Section 18 – Other Limitations on Construction:** This project shall be completed in accordance with Section 18 "Other Limitations on Construction" of the approved Construction Safety Plan Compliance Document.

Yes_____No_*

I certify that, for the project identified herein, the responses to the foregoing items are correct as marked, and that I shall comply with the approved Construction Safety and Plan.

Signed: _____
Contractor's Authorized Representative

Date: _____

_____
Print Name and Title of Contractor's Representative

END OF ITEM SS-101

ITEM SS-110 STANDARD SPECIFICATIONS

GENERAL

110-1.1 The standard specifications adopted by the Texas Department of Transportation (November 1, 2014) are bound in a book titled "Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges". These specifications are referred to herein as "Standard Specifications." The latest edition shall apply. A copy of these "Standard Specifications" may be purchased or downloaded by going to the Texas Department of Transportation's web page, http://www.txdot.gov, contacting Support Services Division, or calling the Texas Department of Transportation's Support Services Division. For additional information on specifications or information on Departmental Materials Specifications (DMS), Material Producer Lists (MPL), Test Procedures, Material Inspection Guide, and other materials information, go to http://www.txdot.gov.

INCORPORATION AND MODIFICATION

110-2.1 Certain parts of the Standard Specifications are appropriate for inclusion in these Technical Specifications. Such parts are incorporated herein by reference to the proper section or paragraph number. The individual specification numbers noted herein may be different from those in the latest edition of the "Standard Specifications." The most current specification number shall apply. Each such referenced part shall be considered to be a part of these Contract Documents as though copied herein in full.

110-2.2 Certain referenced parts of the Standard Specifications are modified in the Specifications that follow. In case of conflict between the Standard Specifications and the Specifications that follow, the Specifications that follow shall govern.

110-2.3 Individual material test numbers change from time to time. Use the latest applicable test.

110-2.4 Reference in the Standard Specifications to the "Department" is herein changed to the "Owner".

END OF ITEM SS-110

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ITEM SS-120 SITE PREPARATION

DESCRIPTION

120-1.1 This item covers the preparation of the site for construction of the proposed improvements. The attention of the bidder is directed to the necessity for careful examination of the entire project site to determine, at the time of bid preparation, the full extent of work to be done under the item "Site Preparation." The entire job site shall be cleared of all man-made obstructions and debris, of whatever nature, and made ready in all respects for the construction of the proposed improvements.

The item "Site Preparation" shall include:

1. Mobilization
2. Furnishing Temporary Field Office
3. Lighted Barricades and Closed Taxiway and Runway Markings
4. Contractor's Access/Haul Road
5. Contractor's Staging Areas
6. Lockout/Tagout Program
7. Airport Security Requirements
8. Airport Safety Requirements
9. Instrument Control
10. Clean Up

CONSTRUCTION METHODS

120-2.1 MOBILIZATION. The Contractor shall consider and include his cost for providing personnel, equipment, materials, bonds, etc. required for the prosecution of the work under this item. This is in unison with Mobilization as described in the General Conditions Section 105.

120-2.2 FURNISHING TEMPORARY FIELD OFFICE. The building for the temporary field office shall be for the exclusive use by the Engineer as a field office and shall conform to the requirements listed below. The dimensions and other requirements specified herein are minimums and the building may be built by the Contractor for the specific purposes noted herein. It is not intended, however, to prohibit the use of commercially built trailers or prefabricated buildings which may deviate in minor dimension or detail from the requirements listed herein but may in some features exceed the listed requirements and in all major respects be entirely suitable for the purpose intended. The Engineer will determine the suitability of any building furnished. It shall be the responsibility of the Contractor to coordinate and obtain also necessary permits and install all required temporary facilities to provide a complete and usable temporary field office.

Minimum requirements for offices:

a. The building may be portable or other suitable type with 7-ft minimum ceiling height; must be floored, weatherproof and reasonably dustproof; must have at least two glazed sliding windows provided with window latches; must have at least one door provided with a substantial lock and all keys placed in the possession of the Engineer. Doors and windows shall be screened. The building need not be new but the facility furnished under this item shall be neat, clean, sound and usable for the purpose intended.

b. The building shall be provided with electric lights and power outlets arranged as directed by the Engineer. The building shall be provided with equipment in good working order. In cold weather

the building shall be provided with adequate vented space heating facilities and fuel for heating. In hot weather the building shall be equipped with adequate air conditioning units. Heating and cooling and telephone utility service will be furnished at no cost to the Owner or Engineer.

c. The building for the field office shall provide not less than 240 sq. ft. of floor space. At least two tables each suitable for desk and drafting table work shall be provided with approximate dimensions of 30" x 48". These tables may be movable, attached to a wall, or built-in. Each table will be provided with at least two drawers (minimum dimensions: 8" deep x 12" wide by 24" long) or equivalent cabinet or shelf space for storing field books and records.

d. The building shall be provided with internet access with a minimum download speed of 24 megabytes per second. This service shall be provided for the length of the contract or construction project, whichever is greater.

Furnishing the field office will not be measured for separate payment, but will be considered subsidiary to "Site Preparation." The building shall remain the property of the Contractor and be returned to him at the close of the construction period.

120-2.3 LIGHTED BARRICADES AND CLOSED TAXIWAY AND RUNWAY MARKINGS. The Contractor shall furnish, install, maintain, and remove closed taxiway and runway markings and lighted barricades in accordance with details on the plans and as directed by the Engineer. The closed runway markers shall be aviation yellow, nylon-reinforced vinyl. The markers shall be secured to the pavement/ground as shown on the plans and as directed by the Engineer. The lighted barricades shall be constructed and installed as shown on the plans. All lighted barricades and closed taxiway and runway markings shall be constructed in accordance with AC 150/5370-2F Operational Safety on Airports During Construction.

All work involved in the furnishing, installation, maintenance, and removal of lighted barricades, barrels and closed runway markings will not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation."

120-2.4 CONTRACTOR'S ACCESS/HAUL ROAD. The Contractor shall layout, construct, maintain, and repair all access/haul roads needed to construct the work. The contractor shall video the any intended haul routes from the edge of airport property to the construction work areas. The existing access roads shown on the plans shall be repaired, as determined necessary by the Engineer, at the close of the project. All such work, including all materials and labor, involved in the layout, construction, maintenance, and repair of the Contractor's access/haul roads will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation." Temporary pipe culverts shall be installed and maintained as required and shall be of the size as directed by the Engineer. The type of pipe used for temporary pipe shall be at the option of the Contractor. Temporary pipe culverts will not be measured for separate payment, but will be considered subsidiary to the access/haul road. All temporary pipe culverts shall be removed by the Contractor and shall remain his property at the close of the project.

120-2.5 CONTRACTOR'S STAGING AREAS. The areas designated in the plans or by the Engineer as the Contractor's staging area shall be cleared and graded by the Contractor as needed for use by the Contractor in constructing the work on this project. All areas used or otherwise occupied by the Contractor for his operations shall be cleaned, regraded, and seeded, as directed by the Engineer, prior to the final acceptance of the project by the Airport. All work involved in the preparation and restoration of areas used or occupied by the Contractor, including clearing, grubbing, regrading, seeding, and installing and removing fence, will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.6 LOCKOUT / TAGOUT PROGRAM. The Contractor shall submit a complete copy of an electrical energy source Lockout/Tagout Program in accordance with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, that meets the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and the related safety requirements are the sole responsibility of the Contractor.

120-2.7 AIRPORT SECURITY REQUIREMENTS. The Contractor shall abide by the Airport Security requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. Any costs associated with the Airport Security requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.8 AIRPORT SAFETY REQUIREMENTS. The Contractor shall abide by the Airport Safety requirements that are outlined in the Construction Safety and Phasing Plan (CSPP) of the plans. All costs associated with the Airport Safety requirements will not be measured for separate payment but will be considered subsidiary to the bid item "Site Preparation."

120-2.9 INSTRUMENT CONTROL. The Contractor will be furnished survey baselines and benchmarks to control the work as shown on the Plans. The Contractor shall be responsible for the additional instrument control necessary to layout and construct the work. The Contractor shall provide the instrument control as provided for in Section 50 of the General Provisions. The Contractor's instrument control of the work shall not be measured for separate payment, but will be considered subsidiary to the bid item "Site Preparation".

120-2.10 CLEAN UP. From time to time, the Contractor shall clean up the site in order that the site presents a neat appearance and that the progress of work will not be impeded. One such clean up shall immediately precede final inspection.

Immediately following acceptance of the work by the Owner, the Contractor shall remove all temporary equipment, surplus materials, and debris resulting from his operations, and leave the site in a condition fully acceptable to the Owner.

MEASUREMENT AND PAYMENT

120-3.1 Site preparation will be measured as a lump sum complete item. Work completed and accepted under this item will be paid for at the contract lump sum price bid for "Site Preparation," which price shall be full compensation for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Item SS-120-1 Site Preparation - per Lump Sum

A minimum of two (2) partial payments will be made for Site Preparation up to a limit based on a percentage of the Total Contract Value and not the amount bid. Periodic payments will be made in proportion to the amount of work accepted for payment in monthly pay applications, as outlined in the table below.

Monthly Pay Application Total exceeds	Partial Payment of Site Preparation
1% of total Contract value	50% of Site Preparation, up to 2.5% of total Contract value, less retainage
5% of total Contract value	100% of Site Preparation, up to 5% of total Contract value, less retainage

Any remaining partial payments for "Site Preparation" will be when the work is completed to 95% of the Contract total value.

END OF ITEM SS-120

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ITEM SS-300 BASIC ELECTRICAL REQUIREMENTS

DESCRIPTION

300-1.1 This item shall consist of furnishing and installing complete electrical systems as defined in the plans and in these specifications. The work includes the installation, connection and testing of new electrical systems, equipment and all required appurtenances to construct and demonstrate proper operation of the completed electrical systems.

300-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars and standards on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

300-1.3 This work shall consist of lockout/tagout and constant current regulator calibration procedures at the airport electrical vault in accordance with the design and details shown in the plans and in compliance with these specification documents.

EQUIPMENT AND MATERIALS

300-2.1 STANDARDS.

a. Applicable National Fire Protection Association (NFPA) codes, including but not limited to:
   (1) NFPA 70 - National Electrical Code.
   (2) NFPA 70E - Standard for Electrical Safety in the Workplace.
   (3) NFPA 72 - National Fire Alarm Code.
   (4) NFPA 101 - Life Safety Code.
   (5) Internet Website: http://www.nfpa.org

b. Applicable Code of Federal Regulations (CFR) codes, including but not limited to:
   (1) 29 CFR 1910 - Occupational Safety and Health Standards (OSHA)
   (2) 29 CFR 1926 - Safety and Health Regulations for Construction.
   (3) Internet Website: http://www.gpoaccess.gov/cfr/index.html

c. ANSI/IEEE C2 - National Electrical Safety Code.

d. NECA 1 – Standard for Good Workmanship in Electrical Construction.

e. Applicable Federal, State and Local Electrical Codes.

f. Applicable Federal, State and Local Energy Codes.

g. Applicable Federal, State and Local Building Codes.

h. Applicable Federal, State and Local Fire Codes.

i. Applicable City Electrical Code.

j. Applicable City Ordinances pertaining to electrical work.

k. Applicable Federal, State and Local - Environmental, Health and Safety Laws and Regulations.

Contractor shall utilize the most current editions of standards, which are current at time of bid and as recognized by the Authority Having Jurisdiction for the respective standard.

300-2.2 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, current version on the date that the submittals are received by the Engineer.

b. Airport lighting equipment and materials shall also meet the Buy American Preference requirements in 49 USC 50101 and the Aviation Safety and Capacity Expansion Act. The equipment

shall be approved and listed on the FAA "Equipment Meeting Buy American Requirements" list located at *www.faa.gov/airports/aip/procurement/federal_contract_provisions/*, current version on the date that the submittals are received by the Engineer, or the Contractor may submit a signed formal letter from the manufacturer that clearly lists the specific equipment, model number, location where it is manufactured, and statement certifying that the equipment and/or materials meet the Buy American Preference requirements.

c. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer. All equipment and materials shall be new and meet applicable manufacturer's standards. All other electrical components and products, not covered under the FAA equipment certification program, shall be tested and listed by an OSHA accepted, nationally recognized testing laboratory (NRTL) to conform to the standards indicated in these contract documents and to the industry standards required in the NEC, NEMA, IEEE, UL, and applicable FAA advisory circulars.

d. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

e. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components or electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

f. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

g. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

(1) All LED light fixtures, with the exception of obstruction lighting, shall be warranted by the manufacturer for a minimum of 4 years after date of installation, final acceptance testing by the Engineer, and Owner's beneficial use of the equipment, inclusive of all electronics. Refer to FAA Engineering Brief No. 67D for additional requirements.

h. Refer to Special Provisions item C-12 Submittals for electronic or paper submittal requirements for Engineer's review.

i. After approval of submitted equipment, the Contractor shall supply the following Operation and Maintenance Manual documentation to the Owner. Two (2) complete sets of documentation shall be supplied for each model of equipment. The documentation shall be securely bound in heavy-duty 3-ring binders. The information for each piece of equipment shall be indexed using typewritten label tabs. The

spine of each binder shall have a typewritten label, which indicates the included equipment types. The documentation shall include:

(1) Approved Submittals and Shop Drawings
(2) Cable Splicer Qualifications, Type and Voltage
(3) State Contractors License with Electrical Classification
(4) Master, Journeyman and Apprentice Electrician Licenses and Certifications
(5) Lockout/Tagout Program
(6) Regulator Load and Calibration Reports for testing, checking and adjusting all regulators in the electrical vault
(7) Megger Test Reports
(8) Ground Rod Test Reports
(9) Installation Manuals
(10) Operation Manuals
(11) Maintenance Manuals
(12) Parts Lists, including recommended spare parts. Recommended spare parts shall be furnished with the respective equipment.

j. After approval of the O&M Manuals, the Contractor shall provide three (3) complete electronic copies of all documentation in Adobe PDF file format on CD-R (non-rewriteable) discs storage media. The electronic files shall contain searchable text and include a hyperlink index for ease in locating information with the PDF file.

k. All requirements herein Item SS-300 shall be applicable to all referenced sections in these contract documents and applicable to all sections which reference Item SS-300.

l. The Contractor is the single source of responsibility for the installation and integration of the airport's lighting, power, and control systems. New airport lighting equipment and materials shall be fully compatible with all other new and existing airport lighting equipment and systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-2.3 OPERATION AND MAINTENANCE DATA.

Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment. Provide bound hard copies and electronic copies as noted in section 300-2.2.

a. Certificate of Substantial Completion, Release and Contractor's Affidavit, executed copies.

b. Final approved equipment submittals, including product data sheets and shop drawings, clearly labeled.

c. Preventive maintenance programs for the visual aid facilities and equipment installed in this project, including the applicable equipment sections within Chapter 5 "Preventive Maintenance" from AC 150/5340-26 (latest edition) "Maintenance of Airport Visual Aid Facilities".

d. Installation manuals: Description of function, installation and calibration manuals, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

e. Operations manuals: Manufacturer's printed operating instructions and procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping,

shutdown, and emergency instructions; summer and winter operating instructions; and all programming and equipment settings.

f. Maintenance manuals: Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

g. Service manuals: Servicing instructions and lubrication charts and schedules, including the names and telephone numbers of personnel to contact for both routine periodic and warranty service for equipment and materials provided under this Specification.

h. Final test reports, clearly labeled, including but not limited to, insulation resistance test reports, ground rod impedance test reports, cable pulling tension values logs, and equipment certification tests.

i. Final certified calibration sheets for all equipment and instruments, including but not limited to, constant current regulator calibration reports.

300-2.4 WIRE. Unless otherwise indicated, conductors No. 10 AWG and smaller shall be solid, and conductors No. 8 AWG and larger shall be stranded.

For electrical work of 600 volts or less, all conductors, terminations, terminal blocks, lugs, connectors, devices and equipment shall be listed, marked, and rated 75 degrees C minimum unless otherwise noted.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway. Pull ropes and pull wires shall have sufficient tensile strength for the cable(s) to be pulled and installed. Damaged cable or raceway shall be replaced at no additional cost to the Owner.

Install pull wires in empty raceways. Use a polypropylene plastic line with not less than 200 pound tensile strength. Secure and leave at least 12 inches of slack at each end of pull wire to prevent it from slipping back into the conduit. Cap spare raceways with removable tapered plugs, designed for this purpose.

Colorable L-824 cable in solid non-fading colors shall not be used for permanent series circuit identification. The color coding shall be continuous throughout the facility and airfield for each series circuit and conductor so that the circuit and conductor are readily identifiable. Mixing of colors for a series circuit is unacceptable.

300-2.5 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, with a minimum 28-day compressive strength of 3500 PSI (unless otherwise noted) using 1-inch (25-mm) maximum size coarse aggregate, as determined by test cylinders made in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Flowable backfill material may only be used where specifically indicated in the Plan details.

300-2.6 SWITCHES. Main disconnect switches 600 volt or less shall be UL service entrance rated, industrial circuit breaker type, pad-lockable, heavy duty type with neutral and ground kits and poles and ratings as indicated on the drawings and suitable for the application indicated. Exterior switches shall be NEMA 3R rated.

300-2.7 WIND CONES AND SEGMENTED CIRCLES.

Provide the wind cone with an L-810 obstruction light, installed as indicated in the plans and in accordance with the manufacturer's recommendations.

The segmented circle airport marker system shall conform to the requirements of AC 150/5340-5, Segmented Circle Airport Marker System. Install the segmented circle. Submit shop drawings for review and approval by the Engineer prior to field construction work.

CONSTRUCTION METHODS

300-3.1 LOCKOUT/TAGOUT PROGRAM. The Contractor shall provide a complete copy of an electrical energy source Lockout/Tagout Program to the Owner, with copy to the Engineer. The document shall clearly identify the on-site master electricians and their contact information, including office and mobile telephone numbers.

The Lockout/Tagout Program shall comply with Part 1910 – Occupational Safety and Health Standards (OSHA) Subpart S – Electrical, and meet the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), including requirements listed in 1910.331 through 1910.335.

Implementation of the Lockout/Tagout Program and all other related safety requirements are the sole responsibility of the Contractor.

300-3.2 SAFETY PROGRAM. The Contractor shall implement an electrical safety program that complies with NFPA 70E and 29 CFR 1926.

Implementation of the Electrical Safety Program, determining and providing proper Personal Protective Equipment (PPE), training and enforcing personnel to wear the prescribed PPE, conducting work area safety inspections (including correcting deficiencies), and all other related safety requirements are the sole responsibility of the Contractor.

All work involved in the preparation and implementation of the safety program will not be measured for separate payment, but will be considered subsidiary to the lockout/tagout bid item.

300-3.3 PRECONSTRUCTION MEETING.

A preconstruction meeting will be held with the Airport, FAA, Engineer and Contractor, prior to any work. Complete submittals and shop drawings will be submitted at this time for review. An equipment procurement schedule will be provided by the Contractor with an anticipated field construction start date. The progress construction schedule will be submitted for review each week and shall outline all installation, testing and demolition work.

300-3.4 GENERAL. In general, the various electrical equipment and material to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards so as to complete the work in a neat and satisfactory manner. The following is a general outline concerning the running of various systems and is to be excepted where the drawings or conditions at the buildings necessitate deviating from these standards.

The drawings and specifications are complementary; any work required by one, but not by the other, shall be performed as though required by both.

All conduits shall be run exposed in the equipment rooms, or run concealed as indicated.

The construction details of the building are illustrated on the drawings. Each Contractor shall thoroughly acquaint himself with the details before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details.

The electrical plans do not give exact locations, etc., and do not show all the offsets, control lines, junction boxes, and other installation details. Each Contractor shall carefully lay out his work at the site to

conform to the job conditions, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide complete operating systems.

The electrical plans show diagrammatically the locations of the various electrical outlets and apparatus and the method of circulating and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, etc., by measurements at the buildings, and in cooperation with other crafts, and in all cases shall be subject to the approval of the Engineer. The Engineer reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

These Specifications and the accompanying Drawings are intended to cover systems which will not interfere with the structure of the buildings, which will fit into the several available spaces, and which will insure complete and satisfactory systems. Each bidder shall be responsible for the proper fitting of his material and apparatus into the buildings.

Should the particular equipment which any bidder proposes to install require other space conditions than those indicated on the Drawings, he shall arrange for such space with the Engineer before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such changes at the Contractor's expense.

Should the particular equipment which any bidder proposes to install require other installation methods, such as larger light base junction structures, etc., he shall include all such equipment and appurtenances in his bid. Should changes become necessary on account of failure to coordinate equipment requirements and comply with this clause, the Contractor shall make such changes at the Contractor's expense.

The Contractor shall be responsible to see that each party furnishes electrical equipment which meets the electrical requirements specified herein and that all systems work together to produce the specified operation.

Where two or more units of the same kind or class of equipment are required, these shall be products of a single manufacturer; however, the component parts need not be the products of one manufacturer.

Each Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these Specifications and Plans, which shall be checked by the Engineer and approved before the work is started, and interferences with the structural conditions shall be corrected by the Contractor before the work proceeds.

Electrical equipment, such as switchgear, switchboards, panelboards, load centers and other power supply equipment, shall not be used as a common enclosure, pull box or junction box for routing conductors of different systems, unless the equipment is specifically designed for this purpose and indicated as such on the Plans.

All electrical equipment shall be securely mounted as indicated in the plans, as required by the contract specifications, as required by guidelines and codes, and as required by the manufacturer using hardware compliant with the environmental conditions.

Interior components of electrical enclosures shall be securely mounted using appropriate hardware within the enclosure. Adhesives or adhesive tapes/strips are not allowed and are prohibited.

Electrical components, including but not limited to, relays, circuit boards, electronics, etc, shall be installed within approved enclosures.

The Contractor shall keep ends of conduits, including those extending through roofs, equipment and fixtures covered or closed with caps or plugs to prevent foreign material from entering during construction.

Where portions of raceways are known to be subjected to different temperatures, where condensation is a problem, and where passing from interior to exterior of a building, the portion of raceway or sleeve shall be filled with an approved material to prevent the circulation of air, prevent condensation, and prevent moisture entry. Sealing of raceways shall not occur until after the conductors and cables have been installed, tested and accepted by the Engineer.

The Contractor shall install any temporary lines and connections required to maintain electric services and safely remove and dispose of them when complete.

All temporary wiring shall conform to OSHA standards. Remove temporary services when work is complete. Any damage to electrical equipment caused by the Contractor shall be repaired at no cost to the Owner.

All non-current carrying parts and neutrals shall be grounded as indicated on the Drawings or as required by the Codes.

White and/or gray outer finish conductors may only be used as grounded conductors or neutral conductors in accordance with NEC.

Install insulated green equipment grounding conductors with all feeder and branch circuits.

Provide separate insulated equipment grounding conductors from grounding system to each electrical equipment, telecommunication equipment, other special electrical system equipment, and appurtenance item location in accordance with NFPA 70 and other applicable standard requirements.

The bidder shall inspect the site, thoroughly acquaint himself with conditions to be met and work to be accomplished. Failure to comply with this shall not constitute grounds for any additional payments.

Where electrical equipment is installed that causes electrical noise interference with other systems either existing or installed under this contract, the offending equipment shall be equipped with isolating transformers, filters, reactors, shielding, or any other means as required for the satisfactory suppression of the interferences, as determined by the Engineer.

All junction boxes, expansion joints, flexible connections, instruments and similar items requiring servicing or repairs shall be installed in an accessible location.

All salvage and equipment removed by the work shall remain the property of the Owner. Material removed from the project shall be stored on the project site where and as directed. Debris shall be removed from the job site and disposed of by the Contractor.

The Contractor shall maintain his work area clean and orderly at all times. Debris shall be removed promptly. The electrical system shall be thoroughly cleaned inside and outside of all enclosures to remove all metal shavings or other work debris, dust, concrete splatter, plaster, paint and lint.

The Contractor shall do all excavating and backfilling made necessary by electrical work and shall remove all surplus or supply any earth required to establish the proper finished grade.

The Contractor shall do all cutting and patching made necessary by electrical work, but in no case shall he cut through or into any structural member without written permission of the Engineer.

All steel conduits, supports, channels, fittings, nuts, bolts, etc. shall be galvanized, corrosion-resistant type unless otherwise noted.

An approved anti-seize compound shall be used on all threads to prevent equipment and thread damage.

Equipment shall be installed in accordance with manufacturer's recommendation. Make all final electrical connections and coordinate all items with other trades.

Correct unnecessary damage caused due to installation of work, brought about through carelessness or lack of coordination. All openings, sleeves, and holes to be properly sealed, fire proofed and water proofed. Any water leaks arising from project construction will be immediately corrected to the satisfaction of the Owner and the Engineer.

The soil surrounding all installed equipment shall be sterilized a distance of 2 feet, in all directions, with the soil sterilant Pramitol or other sterilant approved by the Engineer.

300-3.5 DUCT AND CONDUIT. Conduits shall be galvanized rigid steel unless otherwise indicated or specified. Refer to one-line diagram conduit notes for specific requirements.

Conduit runs shall be one trade size continuously with no reducers allowed. Changing of conduit size is only permitted at manholes, handholes, and boxes and conduit bodies used as outlet, device, junction, or pull boxes, including approved, listed fittings with removable covers.

Use an approved, listed adapter/coupling to convert to other types of conduit. Reducer couplings are not allowed.

For underground service entrance, feeder and branch circuit raceways, offsets and bends over 30 degrees and elbows in Schedule 40 PVC conduit runs shall be Schedule 80 PVC conduit. Underground service entrance PVC conduits shall be concrete encased unless otherwise noted. Underground PVC conduits shall be concrete encased under driveways, roadways, parking lots and other paved areas.

Non-encased conduits shall convert to concrete encased ducts under all paved areas and shall extend at least 3 feet beyond the edges of the pavement unless otherwise noted.

The Contractor shall provide a staked centerline or offset for the duct and manhole system - utilizing the drawings and a site inspection of the existing grounds, grades and utility crossings. The Owner and Engineer shall approve the staking plan that shall be indicated on a drawing submitted for approval before starting any excavation for the ducts. The staking plan shall indicate the proposed location, elevation and dimensions of manholes and handholes. The Engineer reserves the right to adjust duct, manhole and handhole locations and elevations before installation at no additional cost to the Owner.

The bottom surface of trenches shall be essentially smooth and free from coarse aggregate.

Install grounding-and-bonding type bushings and bonding jumpers on all service entrance conduits and on all feeder and branch circuit conduits.

Use conduit bushings at each conduit termination. Where No. 4 AWG or larger ungrounded wire is installed, use insulated bushings.

When EMT is allowed, utilize only steel compression fittings. Die-cast and set-screw fittings shall not be used.

Use double lock nuts at each conduit termination. Use weather tight hubs in damp and wet locations. Sealing lock nuts shall not be used.

Grounding continuity to rigid metal conduit shall be accomplished by grounding bushings/adapters with lugs for connection to grounding counterpoise and/or grounding electrode conductor as defined by NEC.

All exposed wiring shall be run in not less than 1/2 inch (12 mm) galvanized rigid steel conduit. All conduits shall be installed to provide for drainage. Conduit shall be attached to wooden structures with galvanized

pipe straps and fastened with galvanized wood screws not less than No. 8 nor less than 1-1/4 inches (31 mm) long. There shall be at least two fastenings for each 10-foot (3 m) length.

Existing ducts may require clearing before use. It is the responsibility of the Contractor to locate the existing ducts, identify empty or partially empty conduits and clear the conduits as required. Where new cable is to be installed in existing duct, the full length of the duct shall be cleared of debris by mechanical means before the installation of the new cable. Acceptable methods of clearing existing ducts include "hydro-jetting" and "roto-rooting." All existing cables in each re-used duct shall be replaced for the length of the duct and properly spliced in a method approved by the Engineer. Clearing of existing duct banks or conduits is incidental to the cable pay item.

Dedicated ground rods shall be installed and exothermically welded to the counterpoise wire at each end of a duct bank crossing under pavement.

For concrete markers, the impression of letters shall be done in a manner, approved by the Engineer, to effect a neat, professional appearance. The letters shall be stenciled neatly. After placement, all markers shall be given one coat of high-visibility aviation orange paint, as approved by the Engineer.

Existing concrete markers or survey pins for runway thresholds, duct/conduit/cable/splice markings, utility line markings, taxiway points of tangency markings, or other similar items shall be removed and reinstalled or replaced, depending on the project work requirements, as required by a registered professional surveyor to the satisfaction of the Owner and the Engineer.

300-3.6 JUNCTION BOXES AND CONCRETE STRUCTURES.

Junction cans shall have both internal and external ground lugs. Size (diameter) and depth shall be as specified in the plans.

Galvanized cans shall have an external ground lug for mechanical connection/bolting ground clamps bonding.

For concrete structures, each cover and frame shall be galvanized and have a spring assisted, latching mechanism allowing one individual to open the manhole hinged cover(s) using the recessed lifting handles. Covers shall be secured by stainless steel penta-head bolts.

For manholes and handholes, cables shall be well supported on the walls using heavy-duty non-metallic cable racks with multiple arms per stanchion and wide type wire ties for securing the cables. Handholes shall have at least one stanchion on each wall and manholes shall have at least two stanchions on each wall. Adjustable arms shall lock into the stanchion. Stanchion and arm lengths shall be appropriate for the manhole or handhole size and the amount of cables to be supported. At least one spare unused arm stall be installed at each stanchion position. Stainless steel hardware shall be used to securely mount and secure the cable racks to the walls.

Handhole covers shall have custom legends. Coordinate exact text with the Engineer during product submittal reviews.

300-3.7 BACKFILL, COMPACTION, AND RESTORATION. Refer to the backfill, compaction and restoration requirements within Item P-152 where other compaction requirements are specified (under pavements, embankments, etc.)

Trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Backfilling from two directions will not be allowed. No backfilling will be accomplished without the approval of the Engineer or Construction Observer. The Contractor shall ensure all trenches are

inspected prior to being covered and prior to encasement. Any uninspected trenches which are prematurely covered shall be exposed for inspection at the Engineer and Owner's convenience at no additional cost to the Owner. The Construction Observer will coordinate with the Contractor for advance scheduling of trench inspection.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

All concrete/asphalt pavement removal and repair work shall be installed as separate pay items in accordance with Specification P-101 Surface Preparation.

The subgrade below the removed pavement shall be compacted to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D2922. Subgrade preparation will not be measured for separate payment, but will be considered subsidiary to Specification P-101 Surface Preparation.

300-3.8 CABLE AND UTILITY COORDINATION. The existing and the proposed locations of lighting cable are approximate. The Contractor shall be responsible for field locating and identifying the existing lighting circuits to determine their exact routing. The Contractor shall also be responsible for maintaining the lighting systems in a working condition until the new lighting circuits have been installed and tested. The Contractor shall proactively and expeditiously accomplish this cable identification work prior to performing any modifications to the lighting circuits. Coordinate identification work with the Owner and Engineer and make all corrections, additions, etc. on the as-built drawings.

Underground cable and utilities exist within and adjacent to the limits of construction. An attempt has been made to locate these cables and utilities on the Plans. All existing cable and utilities may not be shown on the Plans and the location of the cables and utilities shown may vary from the location shown on the Plans. Prior to beginning of any type of excavation, the Contractor shall contact the utilities, the airport maintenance staff, FAA field personnel and other organizations as required and make arrangements for the location of the utilities on the ground. The Contractor shall maintain the cable and utility location markings until they are no longer required.

The Contractor shall replace or repair any underground cable or utility that has been damaged by the Contractor during excavation to the satisfaction of the owner of the cable or utility at no additional cost to the Owner.

Specific work construction and utility cutover coordination meetings shall be held with the FAA, concerning the utility line relocation work associated with their equipment and facilities. New work including handholes, pull boxes, underground ducts/conduits, and appurtenances required shall meet the respective utility standards and be installed to the satisfaction of the utility owner and the Engineer.

300-3.9 WIRING. The Contractor shall furnish all labor and materials and shall make complete electrical connections in accordance with the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electrical Code.

Provide color coding for phase identification.

Colors for 240/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Neutral: White

Colors for 208Y/120V Circuits:

a. Phase A: Black
b. Phase B: Red
c. Phase C: Blue
d. Neutral: White

Colors for 480Y/277V Circuits:

a. Phase A: Brown
b. Phase B: Orange
c. Phase C: Yellow
d. Neutral: Gray

All new electrical cable shall be marked using color-coded plastic electrical tape which is specifically designed for application on polyethylene-jacketed cable. The tape shall be applied as detailed on the Plans. Marking tape shall be Scotch 35 Vinyl Plastic tape or approved equal.

300-3.10 5 kV CABLE CONNECTIONS.

Cable splicing/terminating personnel shall be licensed electricians who have the minimum continuous experience in terminating/splicing medium voltage cable as listed in Item L-108. The qualifications for these airfield lighting cable splicers shall be submitted for review and approval by the Engineer prior to any work. The Engineer may request sample splices be performed in his presence by the proposed personnel to clearly demonstrate that they have the skill and experience to perform this work. Connector kits and cables shall be provided in sufficient quantity by the Contractor in demonstrating these qualifications at no additional cost to the Owner.

Field-attached plug-in splices using FAA certified L-823 plug and receptacle connector kits, properly sized to the cable being used, shall be installed as shown in the plans. This work shall include the taping and heat shrinking. Refer to Item L-108 for additional requirements.

As an option, the Contractor may utilize enhanced FAA certified L-823 connector kits, such as the Amerace 54Super Kit. These kits do not require taping or heat shrinking. These kits shall be installed in accordance with the manufacturer's installation requirements. Note that the mixing of connector kits is unacceptable. The Contractor shall clearly list and submit the connector kits he proposes to utilize on the project for approval prior to any field construction work, and he shall only install that type during construction unless otherwise noted by the Engineer.

300-3.11 MARKING AND LABELING. Properly identify all electrical equipment.

Wire/Cable Designation Tape Markers:

a. Indoor Dry Locations: UL Recognized Materials, vinyl or vinyl-cloth, self-adhesive, wraparound, self-laminating, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-427 with thermal transfer print type, or approved equal.

b. Outdoor Locations and Indoor Wet and Damp Locations: White polyolefin, non-adhesive, full circle, heat-shrinkable sleeve, cable/conductor markers with computer printer-generated numbers and letters, minimum 1" width. Provide Brady B-342 with thermal transfer print type, or approved equal.

Properly identify all electrical equipment, including but not limited to the following:

a. Switchgear, switchboards, and control panels.
b. Main distribution panel and individual devices within it.
c. Panelboards and individual devices within it.
d. Safety switches and disconnects.
e. Contactors and lighting control center, including all branch circuits.

f. Individually mounted circuit breakers.

Use permanently attached black phenolic plates with 3/8" white engraved lettering on the face of each, attached with minimum two sheet metal screws. Starters and relays connected under this Specification shall be identified whether furnished under this Specification or under other Specifications of this contract. Plates shall be indoor or outdoor rated as required by installation location.

Panelboard identification plates shall indicate panel by identification name, voltage system, ampacity rating and type, AIC rating, and feeder source description.

Identify each receptacle, light switch, junction box, etc. with panelboard identification and circuit number. For all wiring device covers, use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

Identify fire alarm junction boxes with red covers and mechanical control junction boxes with blue covers.

Install all identification as required by current adopted editions of the NFPA 70 - National Electrical Code and NFPA 70E - Standard for Electrical Safety in the Workplace.

300-3.12 REMOVAL AND RELOCATION OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated on the Plans. Any equipment which is damaged during the removal operation shall be subject to a reduction in payment for removal of the equipment. All equipment which is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

The Contractor shall carefully relocate existing equipment as indicated in the Plans. Any equipment that is damaged during the relocation operation shall be replaced at no additional cost to the Owner.

Any existing electrical equipment, conduit, cables, etc. that is damaged during construction shall be replaced at no additional cost to the Owner to the satisfaction of the Owner and the Engineer.

300-3.13 CERTIFICATION AND PERFORMANCE. Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

300-3.14 AS-BUILT DRAWINGS. Before work is started, the Contractor shall obtain at his expense one (1) full-sized set of prints for As-Built records; the Engineer will supply the tracings at printing cost to the Contractor.

The Contractor shall locate all underground and concealed work, identifying all equipment, conduit, circuit numbers, motors, feeders, breakers, switches, and starters. The Contractor will certify accuracy by endorsement. As-Built drawings shall be correct in every detail, so Owner can properly operate, maintain, and repair exposed and concealed work.

The As-Built drawings shall indicate all control system labeling and marking.

The Contractor shall store the As-Built drawings on the site. Drawings shall not be rolled. Make corrections, additions, etc., with pencil, with date and authorization of change.

As-Built drawings must be submitted to Engineer before project will be accepted.

Minor deviations from the Plans and Specifications shall be as approved by the Engineer.

Upon completion of the installation, the Contractor shall adjust the systems to the satisfaction of the Engineer.

300-3.15 TESTING.

General Electrical Testing: Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification and certify compliance with test parameters. Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest. Perform infrared scan tests and inspections of service and power distribution equipment at the respective hangars and provide reports. Electrical equipment will be considered defective if it does not pass tests and inspections. Reports shall include notations of deficiencies, remedial action taken and observations after remedial action.

System and Equipment Testing: All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Airport lighting equipment and special systems shall be tested in accordance with applicable FAA Advisory Circular requirements and the manufacturer's installation instructions. These tests shall also include those system requirements listed within AC 150/5340-26 Maintenance of Airport Visual Aid Facilities.

Test equipment and instruments utilized by the Contractor shall have been calibrated following the manufacturer's recommended schedule to verify their accuracy prior to performing the testing work. The Contractor shall provide instrument calibration certificates on test equipment when requested by the Engineer. Retesting work due to inaccurate or defective instruments shall be performed by the Contractor to the satisfaction of the Engineer at no additional cost to the Owner.

a. Regulator Calibration:

The Contractor shall check and calibrate both new and existing regulators utilizing the enclosed "Constant Current Regulator Calibration Report". Refer to the material section on constant current regulators for additional requirements.

New regulators are calibrated at the factory prior to shipping, while existing regulators typically need checks and calibrations on a routine basis so that they do not get out of tolerance. The intent is to check and/or calibrate these regulators using a high accuracy meter prior to energizing and placing the airfield lighting system in service.

Utilize a high accuracy true RMS ammeter with high accuracy clamp-on current probe when making these measurements (use round type probes, accuracy + or – 2% required, sized per the cable diameter and circuit ampacity to achieve the best accuracy). Adjust regulators per manufacturer's instructions to meet the output currents on each brightness step as listed in Tables 5-2 and 5-3 in AC 150/5340-26.

b. Megger Testing:

The Contractor shall perform megger testing on each existing regulator circuit prior to any work on the electrical system. This information shall be recorded and documented by the Contractor and submitted to the Engineer. The Contractor shall perform megger tests on each regulator circuit after the acceptance test period. This acceptance test information shall be recorded and documented by the Contractor and submitted to the Engineer. Megger test shall be performed in accordance with the requirements of Item L-108.

The Contractor shall submit his initial megger test reports on the enclosed "Insulation-Resistance Test Report" form prior to any work on the electrical system. This report shall be submitted to the Engineer and approved by the Owner prior to Contractor proceeding with his work.

After final acceptance testing has been completed, the Contractor shall complete and submit his final megger test reports to the Engineer and insert copies of the initial and final megger test reports in the Operation and Maintenance Manuals.

Megger testing shall be performed using an insulation meter, such as a Fluke 1507 Insulation Resistance Multimeter, Ideal 61-797 Digital Insulation Meter, or approved equal having an insulation test range up to 10 Gigohms or greater.

Insulation resistance testers for 5kV series circuits shall utilize the 1000V DC source output for testing. The test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

The Contractor shall be responsible to maintain an insulation resistance equal to minimum 80% of the initial testing value through the end of the contract warranty period. This requirement is based on AC 150/5340-26C which states that resistance values inevitably decline over the service life of the circuit and that a 10-20 percent decline per year is considered normal. Note that AC 150/5340-26C cancels AC 150/5340-26B; thus refer to the current edition of the maintenance AC for requirements in this project.

For existing circuit insulation resistance requirements, refer to "Existing Circuits" section of Item L-108.

The insulation resistance to ground for 600V rated cables shall be not less than 100 Megohms when measured per NETA standards.

The installations shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings in accordance with manufacturer's requirements. Testing equipment shall be furnished by the Contractor.

c. Ground Rod Impedance Testing:

The enclosed "Ground Rod Impedance Test Report" form shall be used and testing shall be performed in the presence of the Engineer.

As-Built drawings shall indicate the location of all installed ground rods. Each ground rod shall have a unique identifier that corresponds with its submitted ground impedance test report.

Three-pole fall-of-potential testers that can measure the ground resistance of a ground rod using auxiliary electrodes (staked testing), such as a Fluke 1621 Earth Ground Tester, shall be used for testing individual dedicated equipment ground rods at fixtures

and equipment, or for testing isolated counterpoise ground rods not yet connected to the counterpoise wire.

Clamp-on testers that can measure the ground resistance of a ground rod without using auxiliary ground rods (stakeless testing), such as a Fluke 1630 Earth Ground Clamp Meter or approved equal, shall be used for testing counterpoise ground rods which have already been connected to the counterpoise wire, or ground ring ground rods which have already been connected to the established ground ring system.

Ground impedance test equipment shall be submitted for review and approval by the Engineer prior to performing the tests.

If the ground rod's impedance exceeds 25 ohms, an additional rod shall be driven in a location suitable and approved by the Engineer. However, the additional rod must satisfy the requirements of NEC 250.53 and not be less than 6 feet away from any other ground rod electrode. Additional ground rods shall not be measured for separate payment but shall be considered subsidiary to the counterpoise or respective equipment pay item.

The Contractor shall perform additional tests if required and requested by the Engineer at no additional cost.

The Contractor shall coordinate with the resident Engineer to approve tests daily before proceeding. The Contractor shall fill out a separate test report for each date. Test reports shall be submitted weekly to the Engineer.

300-3.16 INSPECTION FEES AND PERMITS. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

300-3.17 WORK SUPERVISION.

State of Texas: The electrical contractor (whether the general contractor or a subcontractor) shall be a licensed contractor in the state of Texas having an electrical classification suitable for performing the work required in these contract documents.

The Contractor shall designate in writing the qualified electrical supervisor who shall provide supervision to all electrical work on this project. The minimum qualifications for the electrical supervisor shall be a master electrician as defined by the Texas Electrical Safety and Advisory Board. The supervisor or his appointed alternate possessing at least a journeyman electrician license shall be on site whenever electrical work is being performed. The qualifications of the electrical supervisor shall be subject to approval of the Owner and the Engineer.

All master and journeyman electricians shall be licensed in accordance with Texas Board Requirements. The website located at http://www.license.state.tx.us publishes the text of this statutory requirement. No unlicensed electrical workers shall perform electrical work on this project. Apprentice electricians in a ratio of not more than one apprentice per journeyman electrician will be allowed if the apprentices are licensed and actively participating in an apprenticeship program recognized and approved by The State of Texas.

Refer to specification section L-108-2.5 "Splicer Qualifications" for additional requirements.

300-3.18 TRAINING. The training classes shall be coordinated with the Owner and Engineer in advance of the final acceptance testing. Comprehensive operational and maintenance training materials shall be provided by the equipment manufacturer and the Contractor (see section 2.3 OPERATION AND MAINTENANCE DATA).

a. Operations and Maintenance:
   (1) Amount and length: 3-4 hours
   (2) Class size: 3-4 employees
   (3) Location: GA Terminal.
   (4) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (5) Training materials: O&M Manuals
   (6) Provide hands on troubleshooting specifics.

b. Preventive Maintenance Program Recommendations
   (1) List the equipment here:
      i. L-807 Primary Wind Cone
      ii. L-858 Guidance Signs
      iii. L-861T Taxiway Edge Lights
   (2) Discuss failure scenarios and what to do.
   (3) Provide technical assistance points of contact and phone numbers.

Schedule the training with the Owner at least 10 days in advance and notify the Engineer.

Provide hands-on demonstrations and training of equipment components and functions, including adjusting, operating and maintaining the lighting equipment and systems. Coordinate the training schedule with the Owner in advance, so that the Owner may record the training if desired. Provide 4-hours training for the operational personnel and 4-hours training for the maintenance personnel.

METHOD OF MEASUREMENT

300-4.1 The quantity of lockout/tagout and constant current regulator calibration procedures to be paid for shall consist of all lockout/tagout procedure work and all constant current regulator calibration work completed in place, accepted and ready for operation. This item does not include measurement for constant current regulator equipment.

300-4.2 Temporary conduits shall be measured by the linear feet (meter) of conduits installed, including strapping for securing to pavement or turf, flagging, connections to existing stake or base mounted lights, and for pressure treated lumber used to protect the conduit where it crosses a vehicular access, all measured in place, completed, and accepted.

BASIS OF PAYMENT

300-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures – per Lump Sum
Item SS-300-5.2	Non-Encased, Schedule 80 PVC Conduit, 1-Way 1"C, Mounted to Surface for Temporary Electrical Connection – per Linear Foot

MATERIAL REQUIREMENTS

Fed.Spec.J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)

Fed. Spec. W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid
Fed. Spec. W-P-115	Panel, Power Distribution
Fed. Std. 595	Colors
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514	Fittings for Conduit and Outlet Boxes
Underwriters Laboratories Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
CFR 1910	Occupational Safety and Health Regulations
CFR 1926	Safety and Health Regulations for Construction
ANSI/IEEE C2	National Electrical Safety Code
NFPA 70	National Electrical Code (NEC)
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
29 CFR 1910	Occupational Safety and Health Standards (OSHA)
29 CFR 1926	Safety and Health Regulations for Construction
Jaquith Industries, Inc.	The Design, Installation, and Maintenance of In-Pavement Airport Lighting

FAA ADVISORY CIRCULARS

AC 150/5300-13	Airport Design
AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821 Panels for Control of Airport Lighting

AC 150/5345-5	Specifications for Airport Lighting Circuit Selector Switch
AC 150/5345-7	Specification for L-824 for Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Standard for Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853 Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Base and Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Taxiway and Runway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Isolation Transformers for Airport Lighting Systems
AC 150/5346-49	Specification L-854, Radio Control Equipment
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program
AC 150/5345-56	Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

END OF ITEM SS-300

CONSTANT CURRENT REGULATOR CALIBRATION REPORT

Standard Requirements: FAA AC 150/5340-26 (latest edition) Maintenance of Airport Visual Aid Facilities

Owner / Sponsor: _____ Engineer: Garver, LLC _____

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date: _____

Weather / Site Conditions: _____ Last Two Weeks of Rain: _____ inches

Constant Current Regulator #: _____ Serves: _____

	Completed	Comments
1. Check all control equipment for proper operation.	☐	_____
2. Perform short-circuit test. Record results and recalibrate if necessary.	☐	_____
3. Perform open-circuit test on regulators with open circuit protection. Open circuit protective device should de-energize the regulator. Record results.	☐	_____
4. Check and record regulator input voltage and current.	☐	_____
Input Voltage: _____ Input Current: _____		
5. Check and record regulator output load. (ONLY if regulator has monitoring package)	☐	_____
Volt-Amperes: _____		
6. Check and record output current on each brightness step. If output current is outside of the allowable range, adjust the regulator's on-board potentiometer to re-calibrate the output current within the allowable range. Re-record the new output current on this form.	☐	_____

3-Step CCR

B10: _____ B30: _____ B100: _____

5-Step CCR

1: _____ 2: _____ 3: _____ 4: _____ 5: _____

Nominal:	4.8A	5.5A	6.6A	2.8A	3.4A	4.1A	5.2A	6.6A

Tested By: _____ (Signature and Date)

Test Equipment: _____ (Manufacturer and Model No.)

Engineer Witness: _____ (Signature and Date)

Owner / Sponsor Witness: _____ (Signature and Date)

INSULATION RESISTANCE TEST REPORT

Owner / Sponsor:_____ Engineer: Garver, LLC

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Vault ID / Location: _____ Date Initial / Final Tests: _____

Weather / Site Conditions (Initial Test): _____ Last Two Weeks of Rain:_____inches

Weather / Site Conditions (Final Test): _____ Last Two Weeks of Rain:_____inches

		Initial Test Results		Final Test Results	
	Circuit Designation and Color Code	Regulator Size (kW)	Megger Reading Before Field Work (Megohms)	Regulator Size (kW)	Megger Reading After Field Work (Megohms)
1					
2					
3					
4					
5					
6					
Tested By:					
Test Equipment:					
Engineer Witness:					
Owner/Sponsor Witness:					

Provide signature/date and manufacturer/model no. as required in the fields above.

Initial Test Record – Owner Disposition

Owner / Sponsor: _____ (Signature and Date)

Check one only: ☐ Proceed with Installation ☐ Hold

GROUND ROD IMPEDANCE TEST REPORT

Owner / Sponsor: _____ Engineer: Garver, LLC _____

Airport: _____ Contractor: _____

Project Title: _____ Garver Project Number: _____

Date: _____ Weather / Site Conditions: _____

Fall-of-Potential Style Tester (F):
Manufacturer: _____ Model #: _____

Clamp-On Style Tester (C):
Manufacturer: _____ Model #: _____

Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)	Ground Rod #	Test Equipment Style (F or C)	Impedance Value (Ohms)
Tested By:					
Engineer Witness:					

Provide signature/date in the fields above.

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CABLE PULLING TENSION VALUES LOG

Owner / Sponsor: _____

Engineer: Garver, LLC

Airport: _____

Contractor: _____

Project Title: _____

Garver Project Number: _____

Date: _____

Weather / Site Conditions: _____

Dynamometer Manufacturer/Model #: _____

Cable / Wire Manufacturer: _____

From / To Locations	Wire/Cable Size	Length of Pull	Pull Method	Maximum Value	Measured Value
Tested By:					
Engineer Witness:					

Provide signature/date in the fields above.

Page _____ of _____

ITEM SS-301 ELECTRICAL DEMOLITION WORK

DESCRIPTION

301-1.1 This item shall consist of the removal and satisfactory disposal of existing runway and taxiway edge lights, in-pavement lights, guidance signs, markers, manholes, handholes, junction structures, racks, pads, equipment, poles, towers, shelters, and other incidentals, all of which are not designated or permitted to remain, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. This work shall include the removal of indicated equipment, materials, and incidentals necessary for a complete item removal, including all restoration work, as a completed unit to the satisfaction of the Engineer.

Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

301-1.2 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

MATERIALS

301-2.1 All backfill and repair materials used in electrical demolition, repair and restoration work shall comply with the referenced specifications and be approved by the Engineer.

Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

CONSTRUCTION METHODS

301-3.1 GENERAL. No demolition shall be started until the removal and/or relocation work has been laid out and approved by the Engineer. All material shall be disposed of off-site. All hauling and disposal will be considered a necessary and incidental part of the work. Hauling cost shall be considered by the Contractor and included in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor shall remove all existing underground cable, which is unused or rendered unusable by this project, when such is exposed or made accessible during the course of this work. All such wiring removed shall become property of the Contractor and shall be immediately removed from the project. Wiring in conduit shall be removed as indicated or if new wiring is shown to be installed in its place. Existing wiring shall not be reused or reinstalled.

Wiring not exposed shall be abandoned in place, if a reasonable effort will not remove it. No measurement or payment will be made for this cable removal work. Damage to turf or other systems will not be permitted in order to salvage or retrieve existing cable.

Any damage to electrical equipment, systems, structures, conduits, cables, and accessories or other utilities, designated to remain in place, shall be repaired or replaced expeditiously at no additional cost to the Owner and to the satisfaction of the Owner and Engineer.

Holes, ditches, or other abrupt changes in elevation caused by the removal operations that could obstruct drainage or be considered hazardous or unsightly shall be backfilled, compacted, and left in a workmanlike condition.

Trenches or voids resulting from the removal or demolition of existing electrical equipment or other structures shall be filled with approved material placed in layers in accordance with Item P-152.

Concrete foundations and pads to be removed shall be obliterated full depth.

301-3.2 REMOVAL AND/OR RELOCATION OF LIGHT FIXTURES AND EQUIPMENT. Light fixtures and other equipment which are to be removed shall be carefully excavated. All concrete bases and concrete anchors shall be removed by the Contractor. The removed lights, guidance signs, isolation transformers and wiring harnesses shall then be given to the Owner, or properly disposed of if so directed by the Owner. The ground in the area of the removed lighting equipment shall be backfilled and properly compacted. Light fixtures and equipment which are to be relocated shall be stored on site and reinstalled with new lamps, new transformers, and all other new required accessories as indicated in the plans.

301-3.3 REMOVAL OF EXISTING EQUIPMENT. The Contractor shall carefully remove all salvageable equipment as indicated in the plans. Any equipment that is damaged during the removal and/or relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment. All equipment that is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

Any equipment that is damaged during the relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment.

Any equipment that is damaged during the relocation operation shall be repaired or replaced by the Contractor at his expense to the satisfaction of the Owner and Engineer.

METHOD OF MEASUREMENT

301-4.1 The quantity of existing wind cones, removed, to be measured under this item shall be the number of wind cones removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.2 The quantity or existing segmented circle marker systems, removed, to be measured under this item shall be the number of segmented circle marker systems removed as completed units, and accepted by the Engineer. This items shall include restoring the area to match existing, including removing complete foundations, filling and tamping all holes with earth, and clearing and leveling the site.

301-4.3 The quantity of existing lights or guidance signs, removed, to be measured under this item shall be the number of each complete unit removed, and accepted by the Engineer.

This item shall include removing and storing the existing equipment as directed by the Engineer.

Where the light base and concrete structure are indicated to be removed or demolished, the item shall include restoring the area to match existing, including removing the complete concrete item, filling and tamping all holes with earth, and clearing and leveling the site.

Where the light base and concrete structure are to remain, a new blank cover shall be installed for protecting the light base during the construction work. Blank covers shall be removed when the existing equipment is reinstalled and given to the Owner after completion of construction work in the respective area.

BASIS OF PAYMENT

301-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-301-5.1	Existing Concrete Encased, 2'Wx2'L Electrical Handhole, Removed – per Each
Item SS-301-5.2	Existing Concrete Encased, 3'Wx3'L FAA-Style Electrical Handhole, Removed – per Each
Item SS-301-5.3	Existing Stake Mounted Edge Light, Removed – per Each
Item SS-301-5.4	Existing Base Mounted Edge Light, Removed – per Each
Item SS-301-5.5	Existing Base Mounted Edge Light, Removed, Base to Remain – per Each
Item SS-301-5.6	Abandoned Wind Cone Base, Removed – per Each
Item SS-301-5.7	Existing Wind Cone and Foundation, Removed – per Each
Item SS-301-5.8	Existing Segmented Circle Marker System, Removed – per Each
Item SS-301-5.9	Abandoned Sign Base, Removed – per Each
Item SS-301-5.10	Existing Base Mounted Guidance Sign, Removed – per Each
Item SS-301-5.11	Existing Base Mounted Guidance Sign, Removed, Base to Remain – per Each
Item SS-301-5.12	Concrete Encased Duct Bank Removal – per Linear Foot

END OF ITEM SS-301

ITEM SS-305 DIRECTIONAL BORING

DESCRIPTION

305-1.1 This item shall consist of furnishing and installing conduits via directional boring methods, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The borings shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. It shall also include all trenching, backfilling, mandreling installation of drag wires and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of conduit and/or cables, to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

305-2.1 GENERAL. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

All equipment and materials covered by these specifications shall be new and meet applicable manufacturer's standards.

Polyethylene conduits shall conform to SDR 11 type.

The Contractor shall submit a statement of qualifications including previous similar jobs experience in directional boring for the last three (3) years. Previous job description work shall include length, pipe type, pipe size(s) and soil type,

The Contractor shall submit complete shop drawings outlining his directional boring method (including drilling fluids, additives and mixtures), drill rod, bore size, materials, equipment and safety requirements to be utilized on this specific project, for review and approval by the Engineer.

All materials shall be inspected at the job site for damage. Defective materials shall be removed from the job site and replaced with new materials prior to the work.

CONSTRUCTION METHODS

305-3.1 GENERAL. Boring shall be done by pilot hole method using fluid as a lubricant only and shall not undermine the surrounding ground. Jetting will not be permitted. The Contractor shall use a guidance system to assure knowledge of the bore location while making the bore. The Contractor will not be paid for unusable sections.

Locate and clearly mark all utilities prior to start of excavation or drilling. The Contractor will be responsible for damage to pavements, utilities, or other structures caused by his activity. The Contractor shall repair, at his own expense, any damaged pavement, utility, or other structure as directed by the Engineer or the owner of the utility or structure. The Contractor shall not excavate to find a bored casing without specific approval and definitions of limits. No payments will be made for excavation and repair except as shown on drawings.

The Contractor shall inspect the locations where the encasement structures are to be installed and familiarize himself with the conditions under which the work will be performed and with all necessary details for orderly prosecution of the work. The omission of any details in the Plans and herein for the satisfactory installation of the easement in its entirety shall not relieve the Contractor of full responsibility for the installation.

Directional bores shall be a minimum 48" below the existing base. For this project, the existing pavement shall be considered 12" in depth and the existing base shall be considered 12" in depth. Therefore, the overall depth shall be a minimum 72" below the surface of the pavement. The Contractor shall utilize a beacon or other depth reading instrument to verify the depth below the runway.

The bore size shall be the minimum size for the work required. Upsizing the bore will not be allowed.

The Contractor shall utilize a walkover guidance and tracking system to assure the orientation and depth of the bore path. Depth and orientation confirmation shall occur at a minimum of every five feet of lateral distance covered.

The Contractor shall perform all excavation required to complete the work regardless of the material encountered. Excavation from the access shafts (bore pits) in excess of the required to backfill the access shafts and open ditch portion of the line shall be disposed of by the Contractor off of Airport Property.

Pits and trenches shall be constructed and maintained in accordance with the current edition of the OSHA Standard for Excavating and Trench Safety Systems. Restore ground to original conditions after work completion including seeding and topsoiling.

The access shafts (bore pits) for encasement installation shall be rectangular in plan view with the longest dimension being constructed with the direction of the pipe. The access shafts shall be constructed at a location shown on the plans.

Use a high quality drilling fluid to ensure hole stability, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Use only fluid with a composition which complies with all federal, state and local environmental regulations. Mix the drilling fluid with potable water (of proper pH) to ensure no contamination is introduced into the soil during the drilling, reaming, or pipe installation process. The Contractor is responsible for any required pH adjustments.

Disposal of the drilling fluids is the responsibility of the Contractor. Conduct disposal in accordance with all relative environmental regulations and permit requirements. No excess drilling fluids shall remain in the bore access pit or receiving pit. Immediately clean up any drilling fluid spills or overflows from these pits. All excess drilling fluids and mud shall be disposed of off Airport Property on a daily basis. Bore pits and trenches shall be backfilled and compacted in 6" layers to 90% maximum density for cohesive soils and to 100% maximum density for non-cohesive soils, as determined by ASTM D1557. The in-place field density shall be determined in accordance with ASTM D1556, D2167, or D6938.

Assemble the entire pipe to be installed via directional boring prior to starting pull back operations. Support the pipe to enable it to move freely and prevent damage. Install the pipe in one continuous pull. Maximum allowable tensile force imposed on the pull section is not to exceed 90 percent of the pipe manufacturer's safe pull strength. If multiple pipe sizes or materials, the lowest safe strength shall govern. Damaged pipes shall be replaced at no additional cost to the Owner.

Extend and connect pipes to junction structures as indicated. When pipe is used as a sleeve, install interior conduits as indicated and terminate the conduits with end bells as shown in the plans or as required.

Upon completion of the work, immediately remove all debris from the job site and restore the areas to original condition acceptable to the Engineer.

The Contractor shall record and document drilling logs that provide drill bit locations, both horizontally and vertically. These records shall be submitted to the Engineer and included in the O&M manual for the project.

All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

METHOD OF MEASUREMENT

305-4.1 The quantity of directional boring to be paid for under this item shall be the number of linear feet of conduit and directional boring installed with backfill, compaction, turf restoration, and appurtenances, measured in place, completed and accepted to the satisfaction of the Engineer.

BASIS OF PAYMENT

305-5.1 Payment will be made at the contract unit price per linear foot for each type and size of directional boring completed by the Contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-305-5.1 Directional Boring, 2-Way 2"C Polyethylene Conduits – per Linear Foot

END OF ITEM SS-305

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ITEM SS-310 AIRPORT LIGHTING SYSTEMS

DESCRIPTION

310-1.1 This item shall consist of furnishing and installing airport runway and taxiway edge lighting systems, retroreflective markers, guidance signs, runway centerline and touchdown zone lighting systems, other taxiway lighting systems, and other approach lighting aid systems, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. The system shall be installed at the locations and in accordance with the dimensions, design and details shown on the plans. This work shall include the furnishing of all equipment, materials, services and incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

310-1.2 Additional details pertaining to the lighting system covered in this item are contained in the advisory circular, AC 150/5340-30, Design and Installation Details for Airport Visual Aids.

310-1.3 The Contractor shall maintain current copies of all referenced and applicable advisory circulars on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

EQUIPMENT AND MATERIALS

310-2.1 GENERAL.

a. Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300.

b. For pre-cast or prefabricated concrete encased light base installations, the Contractor shall submit and coordinate the construction of the proposed pre-cast units with the Engineer onsite to review and approve the construction process. The Contractor shall submit his proposed installation process for review and approval by the Engineer. The Contractor shall provide additional items and work if required and requested by the Engineer for the construction and installation of the pre-cast units at no additional cost to the Owner.

Pre-cast or prefabricated concrete encased light bases may only be assembled at the Contactor's staging area at the airport in order to allow the Engineer to check and approve all such construction items. Pre-cast bases assembled offsite will not be allowed.

c. For in-pavement fixture installations, the Contractor shall submit his proposed installation method and technique for correct placement and alignment of all lights for review and approval prior to any work.

In-pavement lighting systems will require an experienced electrical supervisor and experienced installation team, including licensed surveyor. This includes the complete installation, layout, and coordination with paving joints and paving work.

310-2.2 LIGHT FIXTURES. Airfield lights shall be supplied with all features and accessories including isolation transformers, light bases, base covers, safety ground rods, concrete pads and incidentals required for a complete installation as defined in these Specifications and as shown on the plans.

a. Medium Intensity Taxiway Lights (MITL):

(1) Taxiway edge elevated lights shall be L-861T(L), LED lamp, omnidirectional blue lens.

(2) Taxiway edge in-pavement lights shall be L-852T(L), LED lamp, Class 2, Style 3

(low profile), omnidirectional blue lens, mounted on a 12" diameter L-868B light base.

310-2.3 LAMPS. Lamps for elevated edge lights shall be LED type as specified.

310-2.4 SPARE EQUIPMENT INCLUDING LAMPS, FIXTURES, AND SPARE SIGN REPLACEMENT COMPONENTS. Provide 10 percent spare lamps of each type installed for lights and signs, minimum quantity of 6 required. Spare lamps shall not be measured for separate payment but shall be considered subsidiary to the light fixture and guidance sign pay items.

Provide 10 percent spare fixtures of each type installed for lights. Provide 10 percent spare sign replacement components of each type installed for signs. Spare fixtures and spare sign replacement components shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

Provide the following spare fixtures:

- 8 L-861T Taxiway Edge Lights
- 1 L-852T Taxiway Edge Ligbt
- 1 set of spare replacement components for a 2-Module, Size 2 L-858 guidance sign
- 1 set of spare replacement components for a 3-Module, Size 2 L-858 guidance sign

a. A spare elevated LED fixture unit shall be one complete, ready-to-install fixture, including the coupling, column, head housing assembly, cordset, LED power supply assembly, LED assembly, and lens assembly.

b. A spare in-pavement LED fixture unit shall be one complete, ready-to-install fixture, including the top cover assembly, bottom pan assembly, cordset, LED power supply assembly, and LED assembly.

c. A spare sign replacement component unit shall include the LED light tube assembly and LED power supply assembly.

The spare lamps, spare fixtures and spare sign replacement components shall be delivered and stored as directed by the Owner, with transmittal receipt signed by Owner's representative. A signed copy shall be forwarded to the Engineer with an additional signed copy placed in the O&M manuals.

310-2.5 GUIDANCE SIGNS. Guidance signs shall be L-858(L), meeting the criteria set forth in AC 150/5345-44, Specification for Taxiway and Runway Signs, and suitable for base mounting. Each unit shall be furnished with the required panels, mounting assemblies, frangible couplings, transformer, intensity control, identification tag, metal tethers, fasteners and safety ground rods.

Style 2 and Style 3 signs shall meet the luminance requirements in AC 150/5345-44 throughout the current ranges of the associated series circuit.

Guidance signs shall have an integral on/off switch for airport maintenance use.

Signs shall be furnished with permanent type nameplates that are both weather and sunlight resistant. Nameplates which are completed with ink markers or similar methods will not be accepted.

Refer to the guidance sign index in the Plans for information on each sign's size, style, class and mode.

The complete sign installation shall be designed to withstand a 200-mph wind load.

Guidance signs shall be Size 2 (15" Legend), Style 2 (3-step circuit), Class 1 (operation range from -4 degrees F to 131 degrees F), Mode 2 (withstand wind loads of 200 mph).

310-2.6 ISOLATION TRANSFORMERS. New isolation transformers shall be Type L-830 and have a

wattage rating suitable for the wattage of the fixture and sign lamps. The transformer shall be listed in FAA Circular AC 150/5345-47.

Provide 10 percent spare isolation transformers of each type installed for lights, signs and other equipment. Spare transformers shall not be measured for separate payment but shall be considered subsidiary to the respective light fixture or sign pay items.

310-2.7 FIELD LIGHTNING ARRESTOR. New series circuit field lightning arrestors shall be installed on the airfield series circuits to reduce the risk of lightning damage to the circuits, including cables, isolation transformers and field/vault lighting equipment. The arrestor assembly shall consist of a NEMA 6P rated metal enclosure, using MOV components, rated for 5,000 volts continuous operating voltage with 25,000 A peak surge current, having a minimum 2 giga-ohm insulation resistance, with L-823 connectors, The arrestors shall be designed specifically for protecting 5 kV airfield series circuits and shall be manufactured by ADB, Astronics or Liberty Airport Systems.

Provide 10 percent spare lightning arrestor units, minimum quantity of 2. Spare arrestors shall not be measured for separate payment but shall be considered subsidiary to the respective arrestor pay items.

CONSTRUCTION METHODS

310-3.1 GENERAL. The installation and testing details for the lighting system shall be as specified in the applicable advisory circulars.

The Contractor is responsible for all surveying and measurement which is required to accurately position and aim airfield lighting systems and equipment.

Airfield lighting systems and equipment that are improperly installed shall be removed and re-installed correctly as directed by the Engineer. No payment will be made for the removal and reinstallation of airfield lighting systems and equipment improperly installed. All remedial work shall be to the satisfaction of the Engineer.

310-3.2 LIGHTING LAYOUT PLANS. The Contractor shall stake the airfield lighting systems, prior to installation of any trench, cable or lighting apparatus. The intent is to stake the installation at the locations indicated, noting any deviation from plan dimensions to the Engineer prior to installation. The Contractor shall obtain the services of an experienced and licensed surveyor to perform this work.

The Engineer shall provide electronic CADD files to the Contractor for this staking work. The Contractor shall stake the items and his surveyor shall provide a CADD file submittal back to the Engineer. Based upon this submittal, the Engineer shall coordinate and provide directions on any adjustments necessary to meet existing field condition requirements and comply with FAA Advisory Circular requirements on the layout and spacing of equipment.

The Contractor and his surveyor shall then make any electronic CADD file spacing adjustments and/or field staking adjustments prior to installation at no additional cost to the Owner.

Refer to General Provisions Section 50 Control of Work for additional construction layout and staking requirements.

310-3.3 PLACING THE EQUIPMENT. The equipment shall be mounted on concrete pads as shown in the plans. Secure the equipment and make all final connections.

310-3.4 MOUNTING, LEVELING, AND AIMING. The concrete support to which the equipment is fastened shall be accurately leveled before mounting the equipment. The units shall be properly aimed, as recommended by the manufacturer of the supplied equipment. This adjustment shall be accomplished using

factory-approved aiming devices and techniques.

310-3.5 PLACING LIGHTS. All equipment shall be installed at locations indicated in the plans. Lights shall be laid out by locating the two control points by station as indicated on the plans and measuring the indicated individual separation distances. Light bases shall be located within 1 inch +/- longitudinally and 0.5 inches +/- transversely of the location indicated unless deviation is approved by the Engineer. Excavation for installation of light bases shall be backfilled with at least 4 inches of granular leveling course, as approved by the Engineer. Fixture height shall be as indicated on the Drawings.

For pre-cast or prefabricated concrete encased light base installations, a leveling course of sand shall be placed in the bottom of the excavated hole, sufficient for accurately installing, leveling and placing the lights in accordance with the requirements in this specification and AC 150/5340-30. Concrete encased light bases shall be allowed to cure a minimum of 7 days prior to installation.

Utilize a bubble level device to level all light fixtures in the horizontal light plane during the day, and then check at night to ensure uniformity in light output.

Provide factory-approved alignment tools and aiming devices to properly level and align fixtures as required by the FAA Advisory Circulars and manufacturer's installation instructions. After all light fixture installations are completed and accepted by the Engineer, these alignment tools and aiming devices shall become property of the Owner and shall be delivered and stored as directed by the Owner.

310-3.6 PLACING SIGNS. All signs shall be installed at the approximate location indicated in the plans. The specific requirements for sign location are specified in AC 150/5340-18, Standards for Airport Sign Systems. Specific requirements of this AC are also shown on the Plans. Signs shall be located within 1 inch +/- longitudinally or 0.5 inches +/- transversely of the required location unless deviation is approved by the Engineer. The locations for the signs shall be staked by the Contractor and approved by the Engineer before installation begins.

Provide single module signs with one tether. Provide multiple module signs with a tether at both ends.

310-3.7 PLACING FIELD LIGHTNING ARRESTORS. All field lighting arrestors shall be installed at locations indicated in the plans, typically about every 2,000 feet around the series circuit. The arrestors shall be installed in base cans or handholes as noted on the plans. Provide a minimum #4 AWG copper ground wire to connect the arrestor ground lug to dedicated ground rod outside the base can or handhole on the pavement side of the equipment. This ground rod shall be connected to the counterpoise system using exothermic welds only. Provide a permanent type marker at each arrestor listing the date it was placed in service.

310-3.8 TRANSFORMER INSTALLATION. The transformer for base mounted fixtures shall be placed inside the base. The transformer for stake mounted fixtures shall be located uniformly as shown on the plans. The primary cable connections shall be made with L-823 connectors as described in Item L-108 and have 3 feet of slack cable. The secondary leads connected to the lamp leads by means of a disconnecting plug and receptacle provided with the unit, and this joint shall not be taped. The secondary joint shall be fastened with a holding ring provided for this purpose.

310-3.9 UNIT ASSEMBLY. All electrical equipment, including edge lights, guidance signs and other visual aid units shall be assembled in accordance with the manufacturer's installation procedures. Anti-seize compound shall be used on all screws, nuts, and threads, including frangible coupling threads. If coated bolts are used (ceramic metallic/fluoropolymer coating), then do not apply anti-seize compound.

Provide and install all spacers, shims, and gaskets as required, and verify they are in place before installing the light fixture on the base.

Bolts and washers for new and existing bases shall be new. Do not reuse existing hardware. The minimum thread engagement into top flange of the base shall be 0.5 inches.

For in-pavement light fixtures, provide Nord-Lock NL 3/8 stainless steel 2 part locking washers or approved equal, as required by the manufacturer.

Coordinate recommended torque values with the light fixture manufacturer, light base can manufacturer, stainless steel bolts and hardware used, and exact anti-seize compound used, in order to prevent light base thread damage. Utilize a dial-type torque wrench for accuracy and to prevent over-tightening bolts. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall submit complete installation method shop drawings and calculations to determine the proper torque requirements for review and approval by the Engineer prior to any field removal or installation work for in-pavement light fixtures.

When installing new or existing light fixtures on existing bases, the following work shall be performed for the removal and reinstallation work:

a. Remove all bolts including any that are frozen or broken. If necessary, drill out and tap for new bolt. If the can threads are galled but usable, clean threads with a tap.
b. Remove the light, base plate, transformer, and any foreign object that may be inside the can.
c. Remove the old cable, mandrel the conduits, and shop-vacuum out the can clean.
d. Install the new cable, connectors, transformer, gasket, bolts, and other required appurtenances per the fixture type and its location in accordance with FAA Advisory Circular requirements and manufacturer's requirements.
e. Never use impact wrenches/drills when removing or installing bolts.

The Contractor shall obtain complete installation manuals for the new airfield lighting equipment and the existing equipment to be reinstalled prior to any removal or installation work. Copies of these manuals shall be maintained in 3-ring binders within the Contractor's onsite field office.

In-pavement light fixtures that are installed too high will require their complete removal and reinstallation at no additional cost to the Owner. In-pavement fixtures shall be provided with all spacers, shims, gaskets and other appurtenances for complete installations that comply with FAA Advisory Circular requirements and manufacturer's installation instructions. All assemblies and work shall be to the satisfaction of the Engineer.

310-3.10 IDENTIFICATION NUMBERS. An identifying number shall be assigned to each light and sign in accordance with the plans or as approved by the Engineer and Owner. This number shall be imprinted with reflective black with 1/2" letters on a non-corrosive metal disc 2" minimum diameter and attached to the pavement side of the fixture with a metal screw.

310-3.11 TEMPORARY AIRFIELD LIGHTING. Refer to the Airfield Lighting Phasing Plans and Details for additional requirements. Existing lighting circuits shall remain operational by use of temporary circuits. New lighting circuits shall also be connected and remain operational by use of temporary circuits. This item shall include all work to maintain the existing and new lighting circuits during construction and allow all taxiways and runways in operation to remain lighted, including that portion through the construction area, as indicated in the Phasing Plans and as directed by the Engineer.

The Contractor shall perform initial field work including location and verification of existing circuits and submit plans for the temporary airfield lighting required in each work phase, for review and approval by the Engineer and Owner, prior to starting work of that phase. This work shall include megger testing of circuits and circuit segments before and after installation and connection of jumpers.

The Contractor shall install couplings and other required fittings/appurtenances in conduit systems at last pavement joint within each phase for connecting to conduit systems in the next phase, or for connecting to existing conduit systems to remain.

310-3.12 TESTING. The installation shall be tested in operation as a completed unit prior to acceptance. Tests shall include taking megger and voltage readings as outlined in Item SS-300 and Item L-108. Testing equipment shall be furnished by the Contractor. Refer to Item L-108 for additional test requirements.

Tests shall be conducted in the presence of the Engineer and shall be to his/her satisfaction.

All installations shall be fully tested by continuous operation for not less than 24 hours as completed systems prior to acceptance. These tests shall include the functioning of each control not less than 10 times.

Equipment and materials covered by FAA Advisory Circulars are referred to by item numbers and approved equipment is listed within the AC 150/5345-53 Airport Lighting Equipment Certification Program's monthly Addendum, which contains a complete and updated listing of the certified equipment and manufacturers, and is listed in the FAA Buy American Preference equipment list, which is also updated monthly. The Contractor shall provide and install new certified equipment that works reliably and efficiently with the existing equipment to remain in service. The Contractor shall provide any additional accessories and/or appurtenances required to provide fully functional electrical systems to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

The Contractor shall ascertain that all lighting system components furnished (including FAA certified and approved equipment) are compatible in all respects with each other and the remainder of the new and existing systems. Any non-compatible components furnished by the Contractor shall be replaced at no additional cost to the Owner with a similar unit that is approved by the Engineer and compatible with the remainder of the airport lighting system.

METHOD OF MEASUREMENT

310-4.1 The quantity of lights of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, base plates, gaskets, couplings, specified height columns, concrete bases, cables, connectors, safety ground rods, bolts/hardware, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare fixture requirements.

310-4.2 The quantity of guidance signs of each type to be measured for under this item shall be the number of each installed, complete with isolation transformers, lamps, junction cans, concrete bases/pads, cables, connectors, safety ground rods, tethers, and all other required appurtenances, as completed units in place, ready for operation, and accepted by the Engineer. See section on Spare Equipment for information on spare sign component requirements.

310-4.3 The quantity of field lightning arrestors, complete with arrestor, base, connectors, equipment safety ground rod, lightning arrestor ground rod, conductors, and all other required appurtenances, to be measured under this item shall be the number of each type installed, as completed units in place, ready for operation, and accepted by the Engineer.

310-4.4 Temporary airfield lighting shall be measured as a lump sum complete item per each respective phase work area, including all work completed in place and ready for operation, and including the installation, protection, and removal of all temporary cables, conduits, lighting, grounding, marking, and associated items and appurtenances, as indicated in the Drawings and as directed by the Engineer.

BASIS OF PAYMENT

310-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item to the satisfaction of the Engineer.

Payment will be made under:

Item SS-310-5.1	L-858(L) Base Mounted, 2-Module Guidance Sign, Installed – per Each
Item SS-310-5.2	L-858(L) Base Mounted, 3-Module Guidance Sign, Installed – per Each
Item SS-310-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed – per Each
Item SS-310-5.4	L-852T(L) Low Profile Base Mounted In-pavement Taxiway Edge Light, Installed in Existing Pavement – per Each
Item SS-310-5.5	Field Lightning Arrestor, Installed – per Each
Item SS-310-5.6	Vehicle Sign Assembly, Installed – per Lump Sum

END OF ITEM SS-310

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ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. All reinforced concrete pipe shall be Class III pipe unless otherwise denoted on the plans. No pick-eye holes will be allowed.

701-2.2 PIPE. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 JOINT FILLERS. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets.

CONSTRUCTION METHODS

701-3.1 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical. *If subsurface conditions require, provide dewatering to carry out the work.*

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 BEDDING. The pipe bedding shall conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. Rigid Pipe. Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than *50%* ~~30%~~ of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least *50%*~~10%~~ of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be *number 57 stone as defined in ASTM C 33 or approved equal.* ~~sand or select sandy soil with 100% passing a 3/8 inch sieve and not more than 10% passing a No. 200 sieve.~~

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth	Minimum Bedding Depth
inch	inch
1/2	1
1	2
2	3
2-1/2	3-1/2

c. PVC, Polyethylene, and Polypropylene Pipe. For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 JOINING PIPE. Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal Pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, and Polypropylene Pipe. Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

701-3.5 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing *or* shall meet the requirements of Item P-153 *when called for in the Plans.* It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2 inch sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.

For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

When called for in the Plans, remove existing stormwater pipe by excavating, removing pipe, disposing of pipe in a manner consistent with local law and codes, and backfill of the excavation following Item P-152.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

701-4.2 *The length of pipe removed shall be measured in linear feet of pipe removed, backfilled, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, prior to removal, whichever is applicable.*

~~**701-4.2** The volume of concrete for pipe cradles shall be the number of cubic yards of concrete that is completed in place and accepted.~~

~~***701-4.2*** *The pipe end sections shall be measured for each complete unit installed in place, completed, and approved. Several classes, types and size shall be measured separately. All fittings and curtain walls shall be included as part of the item*~~

~~**701-4.3** The volume of rock shall be the number of cubic yards of rock excavated. No payment shall be made for the cushion material placed for the bed of the pipe.~~

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated; *and shall include all costs for excavation, dewatering, bedding, backfill and all other miscellaneous costs for installation of the pipe.* ~~at the contract unit price per cubic yard (cubic meter) of concrete for pipe cradles; and at the contract unit price per cubic yard for rock excavation.~~

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

***701-5.2** Payment will be made at the contract unit price per linear foot for removal of pipe of the type and size designated; and shall include all costs for excavation, dewatering, removal and disposal, backfill and all other miscellaneous costs for removal of the pipe.*

Payment will be made under:

Item D-701-1	18" Reinforced Concrete Pipe (Class III) – per Linear Foot

MATERIAL REQUIREMENTS

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains

ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

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ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 BRICK. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 MORTAR. Mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole.

751-2.5 CORRUGATED METAL. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

a. ASTM A48	Gray iron castings
b. ASTM A47	Malleable iron castings
c. ASTM A27	Steel castings
d. ASTM A283	Grade D: Structural steel for grates and frames
e. ASTM A536	Grade 65-45-12: Ductile iron castings
f. ASTM A897	Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 STEPS. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

751-2.8 PRECAST INLET STRUCTURES. Manufactured in accordance with and conforming to ASTM C1433.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. *If subsurface conditions require, provide dewatering to carry out the work.* The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturb and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 BRICK STRUCTURES.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and Cold Weather Protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches . When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 CORRUGATED METAL STRUCTURES. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 INSTALLATION OF STEPS. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.9 BACKFILLING.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the Engineer. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit, completed and accepted.

751-4.2 Reinforcing steel shall not be measured for separate payment but shall be considered subsidiary to the structure in which it is contained.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; *dewatering*; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-1	4'X4' Single Grate Inlet (Heavy-Duty) - per Each
Item D-751-2	4'X4' Junction Box - per Each

MATERIAL REQUIREMENTS

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

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ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

101-1.2 Limits of pavement removal, pavement repair, joint and crack repair, paint and rubber removal, and cold planing are estimated in the plans. Actual limits of these items shall be coordinated with the Engineer prior to construction.

EQUIPMENT

101-2.1 All equipment shall be specified hereinafter or as approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 REMOVAL OF EXISTING PAVEMENT

a. Concrete Pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab, or all multi-layer slabs, 1 foot inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be sawcut the full depth of the pavement. The pavement inside the sawcut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

b. Asphalt Concrete Pavement. Asphalt concrete pavement to be removed shall be cut to the full depth to existing subgrade or soil around the perimeter of the area to be removed. This includes asphalt surfacing, underlying pavement courses, and aggregate base down to top of subgrade or soil. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. If the material is to be wasted on the airport site, it shall be broken to a maximum size as designated by the airport owner.

c. Disposal. All existing pavement removed shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its costs shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.

101-3.2 PREPARATION OF JOINTS AND CRACKS. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks, ignoring hairline cracks (<

1/4 inch wide) with a crack sealant per ASTM D6690. Cracks and joints wider than 1/4 inch and less than 1/2 inch shall be filled with a hot-poured joint sealing conforming to ASTM D 6690. Wider cracks (over 1-1/2 inch wide) along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled within 0 to 1/8 inches (0-3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

a. Soil Sterilants. Soil sterilants shall contain Bromacil or Prometone and shall be approved by the Engineer. Application rates shall be in accordance with the manufacturer's recommendations.

b. Crack Preparation. A high temperature compressed air lance shall be used at all times to blast out any vegetation, dirt, dampness and loose materials from the cracks. Existing crack sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. After cleaning of crack, tack coat shall be applied prior to the application of emulsified asphalt and aggregate.

c. Filler Application. After cracks have been cleaned, received soil sterilant and tack coat, and have been approved by the Engineer, the cracks shall be filled with the emulsified asphalt and aggregate described within this specification. The mix shall be raked in the crack by hand in order to completely fill the entire crack. Once the crack is filled, excess asphalt mix shall be rounded up along the length of the crack, and pinched into the crack using a small asphalt roller. The application and compaction method shall be approved by the Engineer prior to beginning crack cleaning operations.

~~**101-3.3 REMOVAL OF PAINT AND RUBBER.** All paint and rubber over one foot wide that will affect the bond of the new overlay shall be removed from the surface of the existing pavement. Chemicals, high-pressure water, heater scarifier (asphaltic concrete only), cold milling, or sandblasting may be used. Any methods used shall not cause major damage to the pavement. Major damage is defined as changing the properties of the pavement or removing pavement over 1/8 inch deep. If chemicals are used, they shall~~

comply with the state's environmental protection regulations. No material shall be deposited on the runway shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 CONCRETE SPALL OR FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.

a. Repair of Concrete Spalls in Areas to be Overlaid with Asphalt. The Contractors shall repair all spalled concrete as shown on the plans or as directed by the Engineer. The perimeter of the repair shall be sawcut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphaltic concrete with a minimum Marshall stability of 1,200 lbs. and maximum flow of 20 (units of 0.01 in). The material shall be compacted with equipment approved by the Engineer until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphaltic Concrete Pavement Repair. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. The base course and subbase shall be replaced if it has been infiltrated with clay, silt, or other material affecting the load-bearing capacity. Materials and methods of construction shall comply with the other applicable sections of this specification.

101-3.5 COLD MILLING. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a finished surface that provides a good bond to the new overlay. The milling machine or grinder shall operate without tearing or gouging the under laying surface. The milling machine or grinder shall be equipped with automatic grade and slope controls. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material that was removed with new material at no additional cost to the Owner.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Contractor Engineer shall layout the area to be milled with a straightedge in increments of 1 foot widths. The Contractor's layout shall be approved by the Engineer prior to beginning milling operations. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, Grade Correction, or Surface Correction. The milling machine shall have a minimum width of [7] feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade and tolerances specified. The machine shall cut vertical edges. A positive method of dust control shall be provided. The machine shall have the ability to windrow the millings or cuttings**or** remove the millings or cuttings from the pavement and load them into a truck.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove any remaining aggregate or fines.

101-3.6 PREPARATION OF ASPHALT PAVEMENT SURFACES. Existing asphalt pavements indicated to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt concrete similar to that of the existing pavement in accordance with paragraph 101-3.4.

~~b. Repair joints and cracks in accordance with paragraph 101-3.2.~~

~~c. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.~~

~~d. Clean pavement surface immediately prior to placing the surface treatment by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.~~

101-3.7 MAINTENANCE. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 PREPARATION OF JOINTS IN RIGID PAVEMENT.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning Prior to Sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than three inches from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

~~**101-3.9 PREPARATION OF CRACKS IN FLEXIBLE PAVEMENT.**~~

~~**101-3.9.1 Preparation of Crack.** Widen crack with router random crack saw by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, joints will be blown out with a hot air lance combined with oil and water-free compressed air.~~

~~**101-3.9.2 Removal of Existing Sealant.** Existing sealants will be removed by routing random crack saw. Following routing sawing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.~~

METHOD OF MEASUREMENT

101-4.1 PAVEMENT REMOVAL. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor, *regardless of the thickness or composition. Asphalt milling shall be measured by the square yard milled, regardless of thickness.* Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

~~**101-4.2 JOINT AND CRACK REPAIR.** The unit of measurement for joint and crack repair shall be the linear foot of joint.~~

~~**101-4.3 PAINT AND RUBBER REMOVAL.** The unit of measurement for paint and rubber removal shall be the square foot.~~

~~**101-4.4 SPALLED AND FAILED ASPHALTIC CONCRETE PAVEMENT REPAIR.**~~

~~a. The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the Engineer and the Contractor.~~

~~b. The unit of measure for failed asphaltic concrete pavement shall be square feet.~~

~~**101-4.5 COLD MILLING.** The unit of measure for cold milling shall be [___] inches of milling per square yard. The location and average depth of the cold milling shall be determined and agreed to by the Engineer and the Contractor prior to beginning the work. If the initial cut doesn't correct the condition and surface correction is required, the Contractor shall re-mill the area and will be paid only once for the total depth of milling.~~

BASIS OF PAYMENT

101-5.1 PAYMENT. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-1	Concrete Pavement Removal - per Square Yard
Item P-101-2	Milling and Removal of Asphalt Pavement Surfacing (4" thickness) - per Square Yard

MATERIAL REQUIREMENTS

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

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ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions.* At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective Grading. When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3.~~ *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* ~~will~~ be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557.** The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of **2** coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.~~ ~~[The quantity of compacted embankment in-place to be paid for shall be the number of cubic yards measured in its final position.~~

*Measurement of excavation/embankment shall be based on **plan quantities**. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards measured in its original position at the borrow pit.

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D 4318.

154-2.2 SAMPLING AND TESTING. Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

154-3.2 OPERATION IN PITS. The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform

and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

154-3.3 PREPARING UNDERLYING COURSE. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources will be blended and mixed, the subbase material shall be processed in a central *or*travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers of not less than 3 inches nor more than 8 inches of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory

specimens shall be compacted and tested in accordance with **ASTM D1557, determined by the Contractor in the presence of the Engineer**. The in-place field density shall be determined in accordance with **ASTM D 6938 using Procedure A, the direct transmission method, and ASTM D 6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D 6938**. The moisture content of the material at the start of compaction shall be within ±2% of the optimum moisture content. All testing shall be done by **the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.**

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8 inch when tested with a 12 feet straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

154-3.8 SURFACE TOLERANCE. The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 12-foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

154-3.9 THICKNESS CONTROL. The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch deficient in thickness nor more than 1/2 inch above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch or more than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch of the thickness shown. ***There will be no separate payment for additional thickness.*** The thickness of the completed subbase course shall be determined by **depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards.**

154-3.10 PROTECTION. Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

154-3.11 MAINTENANCE. The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of **square yards at the thickness indicated on the PLANS** of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon **depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard of subbase course**. On individual depth measurements, thicknesses more than 1/2 inch in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per square yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-1	8" Subbase Course - per Square Yard

TESTING REQUIREMENTS

ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-154

ITEM P-155 LIME-TREATED SUBGRADE

DESCRIPTION

155-1.1 This item shall be used for soil modification to achieve specific needs that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans. ***Dry placing of lime shall not be used. Slurry placement of lime will be the only acceptable method of placement.***

MATERIALS

155-2.1 LIME. Quicklime and hydrated lime, either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone shall not be permitted.

155-2.2 COMMERCIAL LIME SLURRY. Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

a. **Chemical Composition.** The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.

b. **Residue.** The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve = maximum 0.0%
Residue retained on a No. 10 sieve = maximum 1.0%
Residue retained on a No. 30 sieve = maximum 2.5%

c . **Grade.** Commercial lime slurry shall conform to one of the following two grades:

Grade 1 – The "dry solids content" shall be at least 31% by weight, of the slurry.

Grade 2 – The "dry solids content" shall be at least 35%, by weight, of the slurry.

d. Submittals. *The Contractor shall submit to the Engineer certified test results or manufacturer's certification on the quicklime or lime slurry mix to be used before construction. No work shall begin nor shall any lime or lime slurry be placed for payment until the Contractor has submitted samples of the materials intended for use and the materials have been approved by the Engineer.*

155-2.3 WATER. Water used for mixing or curing shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

155-2.4 SOIL. The soil for this work shall consist of inorganic natural materials on the site or selected materials from other sources; uniform in quality and gradation; and shall be approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches.

COMPOSITION

155-3.1 SOIL-LIME MIXTURE. Lime shall be applied at the rate specified on the plans for the depth of subgrade treatment shown.
155-3.2 TOLERANCES. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Lime	+ 0.5%
Water	+ 2%, -0%

WEATHER LIMITATIONS

155-4.1 WEATHER LIMITATION. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply lime unless the air temperature is at least 40°F and rising. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35°F, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.

Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 EQUIPMENT. The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the lime or lime slurry, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

CONSTRUCTION METHODS

155-6.1 GENERAL. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent courses. The Contractor shall be responsible to meet the above requirements.

Before beginning lime treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. The machine must give visible indication at all times that it is cutting the material uniformly to the proper depth over the entire width of the cut.

If a cutting and pulverizing machine is not used, the material to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. The excavated material shall then be spread to the desired cross-section and uniformly mixed and compacted.

155-6.2 APPLICATION. Lime shall be spread only over an area where the initial mixing operations can be completed during the same work day. The application and mixing of lime with the soil shall be accomplished by the methods described as "Dry Placing" or "Slurry Placing." The Contractor may use either method when hydrated lime is specified.

~~a. Dry Placing. The lime shall be spread uniformly over the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as specified on the plans. The material shall be sprinkled until the specified moisture content has been reached.~~

~~The lime shall be distributed in a manner that will minimize scattering by wind. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to proper application. A motor grader shall not be used to spread the lime.~~

b. Slurry Placing. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry. Commercial lime slurry shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime shall be by successive passes over a measured section of subgrade until the specified amount of lime has been spread. The amount of lime spread shall be the amount required for mixing to the specified depth that will result in the amount determined in the soil-lime mixture or as shown on the plans. The distributor truck shall continually agitate the slurry to keep the mixture uniform.

155-6.3 MIXING. The mixing procedure shall be the same for "Dry Placing" or "Slurry Placing" as hereinafter described:

a. Preliminary Mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 5% above the optimum moisture of the material and to ensure chemical action of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 48 hours or until the material becomes friable. During the curing period, the material shall be sprinkled as directed by the Engineer.

b. Final Mixing. After the required curing time, the material shall be uniformly mixed by approved methods. If the mixture contains clods, they shall be reduced in size by blading, discing, harrowing, scarifying, or the use of other approved pulverization methods so that the remainder of the clods shall meet the following requirements when tested dry by laboratory sieves. After curing, pulverize lime treated material until soil particles pass a one inch sieve and 60% pass the No. 4 sieve. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 COMPACTION. Compaction of the mixture shall immediately follow the final mixing operation with no part of the mixture uncompacted more than 30 minutes after final mixing. The material shall be aerated or sprinkled as necessary to provide the optimum moisture content during compaction. The field density of the compacted mixture shall be at least 93% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested *by the Contractor* in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in- place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. Testing frequency shall be a minimum of one compaction test per **500** square yards of stabilized base or as directed by the Engineer.

The material shall be sprinkled and rolled as directed by the Engineer. All irregularities, depressions, or weak spots that develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the subgrade shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed on it or the work is accepted by the Engineer.

The full depth of the material shown on the plans shall be compacted to remain firm and stable under construction equipment. ~~All~~ *In-place* testing shall be done by the Engineer. Perform in-place density test

to determine degree of compaction between 24 and 72 hours after final compaction and 24 hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. The shape of the course shall be maintained smooth and shall conform to the typical section shown on the plans and the established lines and grades. If the material loses the specified stability, density, and finish before the next course is placed or the work is accepted by the Engineer, the material shall be recompacted and refinished by the Contractor, and the cost shall be incidental to this item.

155-6.5 FINISHING AND CURING. After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch when tested with a 12 feet straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.

The completed section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer. Subsequent courses shall be applied within 14 days after the lime-treated subgrade is cured.

155-6.6 THICKNESS. The thickness of the final lime-treated subgrade shall be not less than the thickness specified. Thickness shall be determined by depth tests or cores taken at intervals so that each test shall represent no more than 300 square yards. When the base deficiency is more than 1/2 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace the base material where borings are taken for test purposes. This cost shall be incidental to this item.

155-6.7 MAINTENANCE. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

155-6.8 HANDLING AND SAFETY. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work.

155-7.2 Lime shall be paid by the number of tons of Hydrated Lime, or the calculated equivalent, used in the completed and accepted work. "Calculated Equivalent" will be determined by the Engineer as follows:

a. Hydrated lime delivered to the project in dry form will be measured according to the actual tonnage either spread on the subgrade or batched on site into a slurry, whichever is applicable.

b. Lime delivered to the project in slurry form will be paid for on the basis of certified chemical composition tickets and batch weight tickets. The Owner shall reserve the right to have the dry lime content verified by an independent testing laboratory. If the chemical composition is reported on the basis of Pebble Quicklime, the equivalent hydrated lime will be determined in accordance with paragraph c. below.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade at the thickness specified. The price shall be full compensation for furnishing all material, except the lime,

and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

155-8.2 Payment shall be made at the contract unit price per pound of lime. This price shall be full compensation for furnishing, delivery, and placing this material.

Payment will be made under:

Item P-155-1	16" Lime-treated subgrade - per Square Yard
Item P-155-2	Lime - per Ton

TESTING REQUIREMENTS

ASTM D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3)
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

MATERIAL REQUIREMENTS

ASTM C 51	Standard Terminology Relating to Lime and Limestone (as used by the Industry)
ASTM C 977	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
ASTM D 3551	Standard Practice for Laboratory Preparation of Soil-Lime Mixtures Using Mechanical Mixer

END OF ITEM P-155

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ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be design, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

156-1.2 *This item covers the application of Temporary Erosion Control items at locations shown on the Plans, as directed by the Engineer, and as required for permit compliance, and the* ***requirement*** *of the Contractor to produce, execute, and maintain a specific Storm Water Pollution Prevention Plan (SWPPP) for the project. The Contractor will also be required to request and obtain all necessary federal, state, and local permits. The temporary erosion control measures shown in the Plans do* ***not*** *represent the extent of work and coordination required by the Contractor under this item.*

MATERIALS

156-2.1 GRASS. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

156-2.2 MULCHES. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per ItemT-908. Mulches shall not create a wildlife attractant.

156-2.3 FERTILIZER. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 SLOPE DRAINS. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 SILT FENCE. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461

156-2.6 OTHER. All other materials shall ~~meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project~~ *be in accordance with SECTION 506 – TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS of the Standard Specifications, except as modified or augmented herein. Heavy Duty silt fencing (with welded wire in the fabric) may be required on*

steep slopes if the Engineer determines that the silt fence used by the Contractor is not performing satisfactory.

CONSTRUCTION REQUIREMENTS

156-3.1 GENERAL. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

~~The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.~~

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 INSTALLATION, MAINTENANCE AND REMOVAL OF SILT FENCES. Silt fences shall extend a minimum of 16 inches and a maximum of 34 inches above the ground surface. Posts shall be set no more than 10 feet on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch overlap and securely sealed. A trench shall be excavated approximately 4 inches deep by 4 inches wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

156-3.5 CONSTRUCTION METHODS. *Providing the temporary erosion control items and devices shown on the Plans is intended to minimize the erosion of soils during construction. However, the items and devices shown are not intended to represent all of the necessary items or procedures required to be implemented by the Contractor. The plans and specifications show the Engineer's estimate of a minimum effort needed to maintain proper erosion control during construction. Additional effort and materials may be required by the Contractor to minimize the erosion of soils during construction. It shall be the Contractor's responsibility to install and maintain all the items shown in the Plans and to coordinate, submit, obtain, and comply with all necessary Federal, State, and local permits. The coordination with governing agencies shall include, but not limited to the following:*

- *Filing the Notice of Intent with TCEQ and paying any fee(s) required with the filing,*
- *Producing and maintaining an approved Storm Water Pollution Prevention Plan,*
- *Coordinating and obtaining all local permits regarding grading operations for the proposed improvements, Contractor's staging area, spoil placement and any other grading operations related to the project as directed by the local governing agency.*
- *Filing the Notice of Termination with TCEQ and paying any fee(s) required with the filing.*

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as *one complete item. This work includes obtaining all necessary federal, state, and local permits required to complete this project.* ~~follows:~~

~~a. Temporary seeding and mulching will be measured by the square yard.~~

~~b. Temporary slope drains will be measured by the linear foot.~~

~~c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard of excavation performed, including necessary cleaning of sediment basins, and the cubic yard of embankment placed as directed by the Engineer.~~

~~d. All fertilizing will be measured by the ton.~~

~~e. Installation and removal of silt fence will be measured by the [linear foot] [Lump sum].~~

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 *Temporary erosion control acceptably completed will be paid for at the contract lump sum price bid for "TEMPORARY EROSION CONTROL," which shall be full compensation for furnishing all materials, tools, equipment, labor, and incidentals necessary to complete the work. Periodic payments will be made under this item in proportion to the amount of work accomplished, as determined by the Engineer. Payment for "TEMPORARY EROSION CONTROL" will also include obtaining and compliance with the SWPPP, which shall include compensation for drainage-way inspections, report preparation, housekeeping practices, cleaning and maintenance, and other actions outlined in the SWPPP prepared by the Contractor necessary to execute the Plan. This item consists of all erosion control items not listed as a separate pay item in the Unit Price Schedule. Any fines issued to the Owner as a result of the Contractor's insufficient execution of the SWPPP will be assessed to the Contractor. Such deductions shall not be limited to the lump sum price of this item.*

Payment will be made under:

Item P-156-1	*Temporary Erosion Control—per Lump Sum*

~~**156-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:~~

~~Item P-156-5.1a~~	~~Temporary seeding and mulching—per Square Yard.~~
~~Item P-156-5.1b~~	~~Temporary slope drains—per Linear Foot.~~
~~Item P-156-5.1c~~	~~Temporary benches, dikes, dams and sediment basins—per Cubic Yard~~
~~Item P-156-5.1d~~	~~Fertilizing—per Ton~~
~~Item P-156-5.1e~~	~~Installation and removal of silt fence [per Linear Feet] [Lump Sum]~~

~~Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.~~

~~Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.~~

MATERIAL REQUIREMENTS

ASTM D6461	Standard Specification for Silt Fence Materials
AC 150/5200-33	Hazardous Wildlife Attractants

END OF ITEM P-156

ITEM P-501 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 AGGREGATES.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine Aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than 0.075mm (No. 200 sieve)	ASTM C117	3.0

Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse Aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than one inch, the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40% when tested in accordance with ASTM C 131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve (9 mm) shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (0.075mm)	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.0)	1.0
Total of all deleterious Material		3.0

Table 1. Gradation for Coarse Aggregate (ASTM C33)

Sieve Designations (square openings)		Percentage by Weight Passing Sieves	
inch	mm	#4 1-1/2 inch – 3/4 inch	#57 1 inch – No. 4
2-1/2	60	---	---
2	50	100	---
1-1/2	38	90-100	100
1	25	20-55	95-100
3/4	19	0-15	---
1/2	13	---	25-60
3/8	9	0-5	---
No. 4	4.75	---	0-10
No. 8	2.36	---	0-5

(1) Aggregate susceptibility to Disintegration (D) Cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation CF = (cumulative percent retained on the 3/8 in. sieve)(100) / (cumulative percent retained on the No. 8 sieve)

(c) The Workability Factor WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF- 28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 CEMENT. Cement shall conform to the requirements of ASTM C 150 Type I.

If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

~~**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.~~

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 JOINT SEAL. The joint seal for the joints in the concrete pavement shall meet the requirements of **Item P-605** and shall be of the type specified in the plans.

501-2.5 ISOLATION JOINT FILLER. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1752, Type II or III and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Carbon-Steel Bars conforming to the requirements of ASTM A615.

501-2.7 DOWEL AND TIE BARS. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted.

Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 WATER. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 ADMIXTURES. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:

Constituent:	Limit (Percent by Mass);
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 EPOXY-RESIN. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1 GENERAL. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 PROPORTIONS. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of **650** psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **517** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall not be more than **0.45** by weight

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a slump for sideform concrete between 1 and 2 inches (25 mm and 50 mm) as determined by ASTM C143. At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at seven (7) and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted

to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.

b. Reactivity Test Results.

c. Coarse aggregate quality test results, including deleterious materials.

d. Fine aggregate quality test results, including deleterious materials.

e. Mill certificates for cement and supplemental cementitious materials.

f. Certified test results for all admixtures, including Lithium Nitrate if applicable.

g. Specified flexural strength, slump, and air content.

h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.

k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 CEMENTITIOUS MATERIALS.

a. Fly Ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b.Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from

laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.4 ADMIXTURES.

a. Air-Entraining admixtures. Air-entraining admixture is to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **5.5%.** Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 CONCRETE MIX DESIGN LABORATORY. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

CONSTRUCTION METHODS

501-4.1 EQUIPMENT. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch Plant and Equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and Transportation Equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Nonagitator trucks. Nonagitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing Equipment. The standard method of constructing concrete pavements **may** be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float- finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 lbs per foot of paving lane width and powered by an engine having at least 6.0 horsepower per foot of lane width.

On projects requiring less than 500 square yard of cement concrete pavement or requiring individual placement areas of less than 500 square yard, or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025- 0.05 inch.

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete Saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100-foot radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting

sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 FORM SETTING. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8 inch at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 CONDITIONING OF UNDERLYING SURFACE. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3 feet to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete.

The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 CONDITIONING OF UNDERLYING SURFACE, SIDE-FORM AND FILL-IN LANE CONSTRUCTION. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 HANDLING, MEASURING, AND BATCHING MATERIAL. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 MIXING CONCRETE. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators.

Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold Weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials

b. Hot Weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature Management Program. Prior to the start of paving operation for each day of paving, the contractor shall provide the engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

501-4.8 PLACING CONCRETE. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches **a flexural strength of 550 psi, based** on the average of four field cured specimens per 2,000 cubic yards of concrete placed. Also, subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi.

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-Form Construction. The concrete shall be distributed uniformly into final position by a self- propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full

width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8000 to 12000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude shall vary proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500 foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

b. Side-Form Construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines.

These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than one foot from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6 to 15 inches on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire- brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 JOINTS. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2 inch from their designated position and shall be true to line with not more than 1/4 inch variation in 10 feet. The surface across the joints shall be tested with a 12 feet straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that

spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

d. Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

e. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer.

f. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

g. Placing dowels and tie bars. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8 inch per feet. Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of ±5/8 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch. The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6 inches to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum **flexural strength of 450 psi** before drilling commences. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of ±1/2 inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of Joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 FINISHING. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straight edge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8 inch of mortar-rich surface (defined as deficient in plus U.S. No. 4 (4.75 mm) sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be

used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand Finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least one foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike- off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straight-edge Testing and Surface Correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8

inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Burlap Drag Finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard (555 grams per square meter). To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16 inch in depth.

501-4.13 CURING. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious Membrane Method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 sq ft. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to

remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

~~**c. Water Method.** The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.~~

d. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

~~**501-4.15 SAW-CUT GROOVING.** If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

501-4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with **Item P-605.**

501-4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 OPENING TO TRAFFIC. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 lb / square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 REPAIR, REMOVAL, REPLACEMENT OF SLABS.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

b. Shrinkage Cracks. Shrinkage cracks, which do not exceed 4 inches in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4 inches in depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs With Cracks through Interior Areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches in depth, that extend into the interior area.

d. Cracks Close To and Parallel To Joints. All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6 inches either side of the joint shall be treated as specified here. Any crack extending more than 6 inches from the joint shall be treated as specified above in subparagraph c.

(1) Full Depth Cracks Present, Original Joint Not Opened. When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure

injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full Depth Cracks Present, Original Joint Also Cracked. At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.

e. Removal and Replacement of Full Slabs. Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars. These joints shall then be carefully sawed on the joint line to within one inch of the depth of the dowel or tie bar.

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment.

Care shall be taken to prevent damage to the dowels, tie bars, or to concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

f. Repairing Spalls Along Joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inch. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high-pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat of epoxy resin, Type III, Grade I, shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Pooling of epoxy resin shall be avoided. The cavity shall be filled with low slump Portland cement

concrete or mortar or with epoxy resin concrete or mortar. Concrete shall be used for larger spalls, generally those more than 1/2 cu. ft. in size, and mortar shall be used for the smaller ones. Any spall less than 0.1 cu. ft. shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Portland cement concrete and mortar mixtures shall be proportioned as directed and shall be mixed, placed, consolidated, and cured as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140°F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper one-eight (1/8th) inch of the pavement surface.

g. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch wide and there shall be a minimum of 55 to 60 blades per 12 inches of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The area corrected by diamond grinding the surface of the hardened concrete should not exceed 10% of the total area of any sublot. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, may require removing and replacing in conformance with paragraph 501-4.19.

501-4.20 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR.

All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface.

a. Removal of Existing Pavement Slab.

When it is necessary to remove existing concrete pavement and leave adjacent concrete in place, unless there are dowels present, the joint between the removal area and adjoining pavement to stay in place, including dowels or tie bars, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made full depth just beyond the end of dowels. The edge shall then be carefully sawed on the joint line to within one inch of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 12 inches from the end of any dowels. All pavement between this last saw cut and the joint line shall be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or the approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in

the pavement which is to remain in place. Where dowels are present, care shall be taken to produce an even, vertical joint face below the dowels. If the Contractor is unable to produce such a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501- 4.10g. All this shall be at no additional cost to the Owner.

Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any direction greater than 1/2 inches and no gradual offset greater than one inch when tested in a horizontal direction with a 12-foot straightedge.

b. Edge repair.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas that are damaged during construction shall be repaired at no cost to the Owner.

(1) Spall repair. Spalls shall be repaired where indicated and where directed by the Engineer. Repair materials and procedures shall be as previously specified in subparagraph 501-4.19f.

(2) Underbreak repair. All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompacted, without addition of any new material. Finally, the void shall be completely filled with paving concrete, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound.

(3) Underlying material. The underlying material adjacent to the edge and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient material shall be kept in place outside the joint line to prevent disturbance (or sloughing) of material under the pavement that is to remain in place. Any material under the portion of the concrete pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified in paragraph 501-4.20b(2). The underlying material outside the joint line shall be thoroughly compacted and moist when new concrete is placed.

MATERIAL ACCEPTANCE

501-5.1 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the Engineer at no cost to the Contractor. The Contractor shall bear the cost of providing curing facilities for the strength specimens, per paragraph 501-5.1a(3), and coring and filling operations, per paragraph 501-5.1b(1). Testing organizations performing these tests shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Concrete shall be accepted for strength and thickness on a lot basis

A lot shall consist of a day's production not to exceed **2,500 square yards.**

a. Flexural Strength.

(1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete shall be sampled in accordance with ASTM C172.

(2) Testing. Two (2) specimens shall be made from each sample. Specimens shall be made in accordance with ASTM C31 and the flexural strength of each specimen shall be determined in accordance with ASTM C78. The flexural strength for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

Immediately prior to testing for flexural strength, the beam shall be weighed and measured for determination of a sample unit weight. Measurements shall be made for each dimension; height, depth, and length, at the mid-point of the specimen and reported to the nearest 1/10 inch. The weight of the specimen shall be reported to the nearest 0.1 pound. The sample unit weight shall be calculated by dividing the sample weight by the calculated volume of the sample. This information shall be reported as companion information to the measured flexural strength for each specimen.

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method.

Slump, air content, and temperature tests will also be conducted by the quality assurance laboratory for each set of strength test samples, per ASTM C31.

(3) Curing. The Contractor shall provide adequate facilities for the initial curing of beams. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

(4) Acceptance. Acceptance of pavement for flexural strength will be determined by the Engineer in accordance with paragraph 501-5.2b.

b. Pavement Thickness.

(1) Sampling. Each lot shall be divided into four equal sublots and one core shall be taken by the Contractor for each sublot. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, shall be excluded from sample locations.

Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes shall be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores shall be determined by the Engineer by the average caliper measurement in accordance with ASTM C174.

(3) Acceptance. Acceptance of pavement for thickness shall be determined by the Engineer in accordance with paragraph 501-5.2c.

c. Partial Lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they shall constitute a lot. Where one or two sublots have been produced, they shall be incorporated into the next lot or the previous lot and the total number of sublots shall be used in the acceptance criteria calculation, that is, n=5 or n=6.

d. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the percentage of material within specification limits (PWL) shall be determined using the remaining test values.

501-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-5.2e:

(1) Flexural strength
(2) Thickness
(3) Smoothness
(4) Grade
(5) Edge slump

Flexural strength and thickness shall be evaluated for acceptance on a lot basis using the method of estimating PWL. Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L).

Acceptance for flexural strength will be based on the criteria contained in accordance with paragraph 501-5.2e(1). Acceptance for thickness will be based on the criteria contained in paragraph 501-5.2e(2). Acceptance for smoothness will be based on the criteria contained in paragraph 501-5.2e(3). Acceptance for grade will be based on the criteria contained in paragraph 501-5.2e(4).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Flexural Strength. Acceptance of each lot of in-place pavement for flexural strength shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

c. Pavement Thickness. Acceptance of each lot of in-place pavement shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

d. Percentage of Material Within Limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The lower specification tolerance limit (L) for flexural strength and thickness shall be:

Lower Specification Tolerance Limit (L)

Flexural Strength	0.93 x strength specified in paragraph 501-3.1
Thickness	Lot Plan Thickness in inches, - 0.50 in

e. Acceptance Criteria.

(1) Flexural Strength. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(3) Smoothness. As soon as the concrete has hardened sufficiently, but not later than 48 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each section of pavement having an average profile index meeting the requirements of paragraph 501-8.1c when evaluated with a profilograph; and the finished surface of the pavement shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. When the surface smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the pavement, full depth removal and replacement of pavement shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet or more often if directed by the Engineer. Maximum gap on final pavement surface > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the one third points of paving lanes when widths of paving lanes are 20 ft or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. Smoothness readings will not be made across grade changes or cross slope transitions, at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement surface > 1/4 inch in longitudinal direction will be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

~~**(ii) Profilograph Testing.** Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.~~

~~The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. Deviations on final surface in longitudinal direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.~~

~~Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches per mile or less. If the initial average profile index was less than 15 inches, only those areas representing greater than 0.4 inch deviation will be re-profiled for correction verification.~~

~~**(iii) Final profilograph of runway.** Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.~~

~~Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 48 hours of placement of material. Smoothness texting indicated in paragraph (iii) shall be performed within 48 hours final paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then~~

~~production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.~~

(4) Grade. An evaluation of the surface grade shall be made by the Engineer for compliance to the tolerances contained below. The finish grade will be determined by running levels at intervals of 50 ft or less longitudinally and all breaks in grade transversely (not to exceed 50 ft) to determine the elevation of the completed pavement. The Contractor shall pay the costs of surveying the level runs, and this work shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

(a) Lateral Deviation. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.

(b) Vertical Deviation. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.

(5) Edge Slump. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer in accordance with paragraph 501-4.8a.

f. Removal and Replacement of Concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 501-4.10 shall apply to all contraction joints exposed by concrete removal. Removal and replacement shall be in accordance with paragraph 501-4.20.

CONTRACTOR QUALITY CONTROL

501-6.1 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that effect the quality of the pavement including but not limited to:

a. Mix Design
b. Aggregate Gradation
c. Quality of Materials
d. Stockpile Management
e. Proportioning
f. Mixing and Transportation
g. Placing and Consolidation
h. Joints
i. Dowel Placement and Alignment
j. Flexural or Compressive Strength
k. Finishing and Curing
l. Surface Smoothness

501-6.2 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

a. Fine Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 70 or ASTM C 566.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 566.

c. Slump. Four slump tests shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air Content. Four air content tests, shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Four unit weight and yield tests shall be made in accordance with ASTM C 138. The samples shall be taken in accordance with ASTM C 172 and at the same time as the air content tests.

501-6.3 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, moisture content and air content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and Coarse Aggregate Gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in the Lower Specification Tolerance Limit (L) table above and the Control Chart Limits table below shall be superimposed on the Control Chart for job control.

b. Slump and Air Content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

CONTROL CHART LIMITS			
Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1 inch	+0.5 to -1.5 inch	± 1.5 inch
Air Content	±1.2%	± 1.8%	± 2.5%
Fixed Form			
Slump	+ 0.5 to -1 inch	+1 to -1.5 inch	± 1.5 inch
Air Content	± 1.2%	± 1.8%	± 2.5%

The individual measurement control charts shall use the mix design target values as indicators of central tendency.

501-6.4 CORRECTIVE ACTION. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of control. The Contractor Quality Control Program shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and Coarse Aggregate Gradation. When two consecutive averages of five tests are outside of the specification limits in paragraph 501-2.1, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Fine and Coarse Aggregate Moisture Content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

c. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

d. Air Content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range; or
(2) two points in a row fall outside the Action Limit line for individual measurements.

Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

METHOD OF MEASUREMENT

501-7.1 Portland cement concrete pavement shall be measured by the number of **square yards** of either plain or reinforced pavement as specified in-place, completed and accepted.

The Contractor's Quality Control Plan shall not be measured separately but shall be considered an incidental aspect of the pavement construction.

BASIS OF PAYMENT

501-8.1 PAYMENT. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-5.2 Acceptance Criteria shall be based on results of smoothness, strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness and 501-8.1c for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed **100 percent** of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both flexural strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both flexural strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either flexural strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both flexural strength and thickness are less than 100%.

PRICE ADJUSTMENT SCHEDULE [1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment limitation shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%.

b. Payment. Payment shall be made under:

Item P-501-1 12.5" Portland Cement Concrete Pavement—per square yard

c. Basis of adjusted payment for Smoothness. Price adjustment for pavement smoothness will apply to the total area of concrete within a section of pavement and shall be applied in accordance the following equation and schedule:

(Square yard in section) × (original unit price per square yard) × PFm = reduction in payment for area within section

Average Profile Index (Inches Per Mile) Pavement Strength Rating			Contract Unit Price Adjustment (PFm)
Over 30,000 lb	30,000 lb or Less	Short Sections	
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	0.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 and up	15.1 and up	22.1 and up	Corrective work required

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing With Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662 Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A714	Standard Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving And Structural Construction
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
AC 150/5320-6	Airport Pavement Design and Evaluation
PCA	Design and Control of Concrete Mixtures

END ITEM P-501

ITEM P-605 JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

This item shall also consist of the cleaning and sealing of cracks and joints in existing concrete pavement, at the locations shown in the plans or as directed by the Engineer. The amount of crack filling/sealing designated in the Plans is estimated.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealant materials shall meet the requirements of **ASTM D 5893, Type SL Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.**

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 BACKER ROD. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the ~~crack~~ joint.

605-2.3 BACKUP MATERIALS. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.4 BOND BREAKING TAPES. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.5 HERBICIDES. *Submit documentation on all herbicides to be used in the preparation of the joint replacement. Include in submittal proposed application rates in accordance with Texas Department of Agriculture regulations.*

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

Prior to beginning the sealing operation, the Contractor shall have the sealant supplier demonstrate, to the satisfaction of the Engineer, the cleaning and installation procedures for the joint sealant to be installed on the project.

If the pavement must be opened to traffic prior to placement of the sealant, Contractor to temporarily fill the joint with a jute or nylon rope immediately after the joint is sawed and or opened. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch below the pavement surface. The rope shall be removed immediately prior to cleaning and or sealing.

605-3.2 EQUIPMENT. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **15** days prior to use on the project.

605-3.3 PREPARATION OF JOINTS *IN NEW PAVEMENT*.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint faces shall be surface dry when the seal is applied.

Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by sandblasting as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Back-Up Material. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-Breaking Tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 INSTALLATION OF SEALANTS *IN NEW PAVEMENT*. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install

the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 PREPARATION OF JOINTS/CRACKS IN EXISTING PAVEMENT

a. Cleaning and Sealing of Cracks. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from the cracks shall be accomplished by routing. Cracks shall be routed so that the exposed face of the crack is enlarged to a width of 1/2" and to a depth as detailed in the sealant manufacturer's recommendations. Other methods of crack cleaning and preparation may be used with the approval of the Engineer.*

b. Cleaning and Sealing of Joints. *Removal of any vegetation, dirt, loose materials, and deteriorated sealant from existing joints shall be accomplished via the use of a high temperature compressed air lance. Existing joint sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingment condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. Other methods of joint cleaning and preparation may be used ONLY with the approval of the Engineer.*

If vegetation is a problem a soil sterilant shall be applied. Soil sterilants shall contain Bromacil (or equal) or Diuron (or equal) and shall be approved by the Engineer. Application rates shall be maximum recommended by the manufacturer.

When the cracks/joints are thoroughly dry, and just prior to sealant placement, both vertical faces shall be cleaned by sandblasting with a nozzle attached to an aiming device that directs the sand blast at approximately a 45 degree angle and a maximum of two inches from the face of the crack/joint. Each crack/joint face shall be sandblasted individually. After sandblasting, compressed air shall be used to blow out the crack/joint and remove all residual dust. Air compressors shall be equipped with suitable traps capable of removing all free water and oil from the compressed air and shall be capable of furnishing air with a pressure greater than 90 psi. The cracks/joints shall be thoroughly dry before the sealant is placed.

All cracks/joints shall be sealed the same day of the final sandblasting. Cleaned cracks/joints left open overnight or cracks/joints which become contaminated before sealing shall be re-cleaned as specified above.

605-3.6 INSPECTION. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.7 CLEAN-UP. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 *For joint sealing in newly constructed pavements, there will be no measurement for payment under this item. For joint cleaning and re-sealing in existing concrete pavement,* Joint sealing ~~material~~ shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 *For joint sealing in newly constructed pavements, there will be no separate payment under this item. Include costs associated in this item as subsidiary to other items.*

605-5.2 *For joint cleaning and re-sealing in existing concrete pavement,* Payment for joint sealing material shall be made at the contract unit price per **linear foot**. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-1	Concrete Joint Clean and Seal - per Linear Foot

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

END OF ITEM P-605

ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of reinforced structural Portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

Gradation For Coarse Aggregate

Percentage by Weight Passing Sieves	Sieve Designation (square openings)
	No. 4 to 1 in. (4.75-25 mm)
2" (50 mm)	---
1-1/2" (38 mm)	100
1" (25 mm)	90-100
3/4" (19 mm)	---
1/2" (12 mm)	25-60
3/8" (9 mm)	---
No. 4	0-10

610-2.2.1 AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING. Aggregates that have a history of D-cracking shall not be used.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 CEMENT. Cement shall conform to the requirements of **ASTM C 150** Type **I or II.**

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

610-2.6 ADMIXTURES AND SUPPLEMENTARY CEMENTITIOUS MATERIAL. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-Entraining Admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

~~**c. Other chemical admixtures**. The use of set retarding, and set- accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set- accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.~~

~~**d. Lithium nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:~~

~~Constituent~~	~~Limit (Percent by Mass)~~
~~LiNO3 (Lithium Nitrate)~~	~~30 ±0.5~~
~~SO4 (Sulfate Ion)~~	~~0.1 (max)~~
~~Cl (Chloride Ion)~~	~~0.2 (max)~~
~~Na (Sodium Ion)~~	~~0.1 (max)~~
~~K (Potassium Ion)~~	~~0.1 (max)~~

~~Provide a trained representative to supervise the lithium nitrate admixture dispensing and mixing operations.~~

e. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of ASTM **D 1752.**

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of **Reinforcing Steel** conforming to the requirements of **ASTM A615.**

610-2.10 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to **one of the following**.

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of **3,000 psi** in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, ±1%, as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 QUALIFICATIONS FOR CONCRETE TESTING SERVICE. Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

610-3.5 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

610-3.6 CONSISTENCY. The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

610-3.7 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

610-3.8 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.9 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

610-3.10 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.11 EMBEDDED ITEMS. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.12 PLACING CONCRETE. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been ~~approved~~ *reviewed by the Engineer*. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.13 VIBRATION. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a

compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

610-3.14 CONSTRUCTION JOINTS. If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.15 EXPANSION JOINTS. Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

610-3.16 DEFECTIVE WORK. Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

610-3.17 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

610-3.18 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

610-3.19 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.20 COLD WEATHER PLACING. When concrete is placed at temperatures below 40°F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F.

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds of Type 1 nor more than 1.6 pounds of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas,

framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F until at least 60% of the designed strength has been attained.

610-3.21 HOT WEATHER PLACING. Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed **90°F** when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

610-3.22 FILLING JOINTS. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete shall be ~~measured by the number of cubic yards of concrete complete in place and accepted. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer.~~ *not be measured for separate payment unless otherwise noted.* No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions in yardage shall be made for the volumes of reinforcing steel or embedded items.

610-4.2 Reinforcing steel shall be *not be measured for separate payment.* ~~measured by the calculated theoretical number of pounds placed, as shown on the plans, complete in place and accepted. The unit weight used for deformed bars shall be the weight of plain square or round bars of equal nominal size. If so indicated on the plans, the poundage to be paid for shall include the weight of metal pipes and drains, metal conduits and ducts, or similar materials indicated and included.~~

BASIS OF PAYMENT

610-5.1 Payment shall *not be paid for separately but shall be considered subsidiary to the item in which it is contained, unless otherwise noted.* ~~be made at the contract unit price per cubic yard for structural Portland cement concrete and per pound for reinforcing steel. These prices shall be full compensation for furnishing all materials and for all preparation, delivery and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

~~Payment will be made under:~~

~~Item P-610-5.1 Structural Portland Cement Concrete – per Cubic Yard~~

~~Item P-610-5.2 Steel Reinforcement – per Pound~~

TESTING REQUIREMENTS

ASTM C 31 Making and Curing Test Specimens in the Field

ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 666	Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar- Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A 184	Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 704	Welded Steel Plain Bars or Rod Mats for Concrete Reinforcement
ASTM C 33	Concrete Aggregates
ASTM C 94	Ready-Mixed Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheet Materials for Curing Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 595	Blended Hydraulic Cements
ASTM C 618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T 26	Quality of Water to be Used in Concrete
ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 MARKING MATERIALS. Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2. Paint shall be furnished in **White (37925), Red (31136), Yellow (33538 or 33655), or Black (37038)** in accordance with Federal Standard No. 595.

a. WATERBORNE. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type I. The non- volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

~~**b. EPOXY.** Paint shall be a two component, minimum 99% solids type system conforming to the following:~~

~~**(1) Pigments.** Component A. Percent by weight.~~

~~**(a) White:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 18% minimum (16.5% minimum at 100% purity).~~

~~**(b) Yellow and Colors:**~~
~~Titanium Dioxide, ASTM D476, type II shall be 14 to 17%.~~

~~Organic yellow, other colors, and tinting as required to meet color standard.~~

~~Epoxy resin shall be 75 to 79%.~~

~~**(2) Epoxy Content.** Component A. The weight per epoxy equivalent, when tested in accordance with ASTM D1652 shall be the manufacturer's target ±50.~~

~~**(3) Amine Number.** Component B. When tested in accordance with ASTM D2074 shall be the manufacturer's target ±50.~~

~~**(4) Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.~~

~~(5) Daylight Directional Reflectance:~~

~~(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.~~

~~(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:~~

~~x .462~~	~~x .470~~	~~x .479~~	~~x .501~~
~~y .438~~	~~y .455~~	~~y .428~~	~~y .452~~

~~(6) Accelerated Weathering.~~

~~(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.~~

~~(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.~~

~~(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2b(5) above. Evaluate for conformance with the color requirements.~~

~~(7) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.~~

~~(8) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.~~

~~(9) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.~~

~~(10) Hardness, Shore. Hardness shall be at least 80 when tested in accordance with ASTM D2240.~~]

~~c. METHACRYLATE. Paint shall be a two component, minimum 99% solids-type system conforming to the following:~~

~~(1) Pigments. Component A. Percent by weight.~~

~~(a) White:~~
~~Titanium Dioxide, ASTM D476, type II shall be 8% minimum. Methacrylate resin shall be 18% minimum.~~

~~(b) Yellow and Colors:~~

~~Titanium Dioxide, ASTM D476, type II shall be 1% minimum.~~

Organic yellow, other colors, and tinting as required to meet color standard.

Methacrylate resin shall be 18% minimum.

(2) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(3) Daylight Directional Reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(4) Accelerated Weathering.

(a) Sample Preparation. Apply the paint at a wet film thickness of 0.013 inch to four 3 x 6 inch aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) Testing Conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F, and four (4) hours condensate exposure at 104°F.

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 620-2.2c(3) above. Evaluate for conformance with the color requirements.

(5) Volatile Organic Content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry Opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch. The minimum opacity for white and colors shall be 0.92.

(7) Abrasion Resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch. Five liters (17.5 lb) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs) of sand for the removal of the paint films.

(8) Hardness, Shore. Hardness shall be at least 60 when tested in accordance with ASTM D2240.

d. SOLVENT-BASE. Paint shall meet the requirements of Commercial Item Description A-A-2886B Type I, Type II, and Type III.

e. PREFORMED THERMOPLASTIC AIRPORT PAVEMENT MARKINGS. Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.

(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.

(a) The markings must be supplied with an integral, non-reflectorized black border.

(2) Graded Glass Beads.

(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type IV.

(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (±10%) per 10 square feet. These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.

Size Gradation		Retained, %	Passing, %
US Mesh	µm		
12	1700	0 – 2	98 – 100
14	1400	0 – 3.5	96.5 – 100
16	1180	2 – 25	75 – 98
18	1000	28 – 63	37 – 72
20	850	63 – 72	28 – 37
30	600	67 – 77	23 – 33
50	300	89 – 95	5 – 11
80	200	97 – 100	0 – 3

(3) **Heating Indicators.** The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.

(4) **Pigments.** Percent by weight.

(a) White:
Titanium Dioxide, ASTM D476, type II shall be 10% minimum.

(b) Yellow and Colors:
Titanium Dioxide, ASTM D476, type II shall be 1% minimum.

Organic yellow, other colors, and tinting as required to meet color standard.

(5) **Prohibited Materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(6) Daylight Directional Reflectance.

(a) White:

The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(7) Skid Resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil.

(9) Environmental Resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed Thermoplastic Airport Pavement Marking Requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross- sectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be re-opened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements for **Federal Specification TT-B-1325D, Type I, Gradation A.** Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. **Painting operations shall be discontinued when the surface temperature exceeds 120°F.** Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by **waterblasting** or by other methods as required to remove all contaminants while minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. *Grinding of the pavement will not be permitted.* After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are cleaned of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

At least 24 hours prior to remarking existing markings, the existing markings must be ~~removed~~ *prepared* **such that ~~75% existing markings are removed~~** *any loose or contaminated material that will affect the bond of the new paint are removed.* **After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air or both.** *The preparation is NOT to damage the pavement around and beneath the paint being prepared for remarking. Any damage is to be corrected immediately at no additional cost to the Owner.*

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by

the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of **30 days** shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 TEST STRIP. Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS
~~(See Note Regarding Red and Pink Paint)~~

Paint Type	Paint Square feet per gallon, ft^2/gal	Glass Beads, Type I, Gradation A Pounds per gallon of paint—lb./gal.	Glass Beads, Type III Pounds per gallon of paint—lb./gal.	Glass Beads, Type IV Pounds per gallon of paint—lb./gal.
Waterborne Type I	**115 ft^2/gal max**	**7 lb/gal min (0.85 kg/l)**	--	--

When pavement markings are required on a newly placed pavement, the pavement markings shall be completed in two applications. The first application shall be 33% of the application rate specified in Table 1. The second application shall be 100% of the application rate specified in Table 1, placed in the opposite direction of the first pass. Glass beads shall only be included in the second application of the pavement markings.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 APPLICATION – PREFORMED AIRPORT PAVEMENT MARKINGS.

a. Asphalt and Portland Cement To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet and a free span between supporting wheels of no less than 18 feet. The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.

620-3.8 PROTECTION AND CLEANUP. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

620-3.9 REMOVAL OF EXISTING MARKINGS. *The existing pavement markings shown on the plans to be removed shall be removed without damaging the existing pavement. The markings shall be removed through the use of high-pressure water or other methods approved by the Engineer before removal operations begin. For areas to be repainted, the existing painted surface shall be cleaned by high-pressure water blasting or sand blasting, as required, to remove all foreign material which would reduce the bond between the new paint and the old paint.*

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be **the number of square feet of painting including reflective media when required** ~~**and the number of pounds of reflective media**~~ performed in accordance with the specifications and accepted by the Engineer. *Where multiple pavement marking applications are specified, there will be no separate payment for temporary pavement markings (first pass). If either the temporary or final application of pavement markings are not required, the contract quantity shall be adjusted according to the markings actually completed.*

The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting including reflective media when required, performed in accordance with the specifications and accepted by the Engineer.

620-5.2 *Payment shall be made at a lump sum price for paint marking removal. The price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.*

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract **price per square foot** for runway and taxiway painting and for reflective media *and lump sum for pavement marking removal. For paint markings*

placed on existing pavement markings, there is no separate pay for pavement marking preparation as described in this item and is to be considered inclusive of the pavement markings pay item. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1	Retro-Reflective Pavement Markings - per square foot
Item P-620-2	Non-Reflective Black Outline - per square foot
Item P-620-3	Pavement Marking Removal - per lump sum

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D
Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247 Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E
Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B

Paint, Traffic, Solvent Based

FED STD 595 Colors used in Government Procurement

AC 150/5340-1 Standards for Airport Markings

END OF ITEM P-620

ITEM P-631 REFINED COAL TAR EMULSION WITH ADDITIVES, SLURRY SEAL SURFACE TREATMENT

DESCRIPTION

631-1.1 This item shall consist of a mixture of emulsified asphalt, mineral aggregate, and water properly proportioned, mixed, and spread on an asphalt pavement surface, including airport pavements serving airplanes 12,500 lbs or less, roads, and other general applications. The purpose of this refined coal tar emulsion product is to provide a fuel-resistant surface where pavements are subjected to fuel spills. The application of the surface treatment shall be in accordance with these specifications and shall conform to the dimensions shown on the plans or as directed by the Engineer.

631-1.2 GENERAL. This item shall consist of a mixture of refined coal tar emulsion, mineral aggregate, additives, and water properly proportioned, mixed and applied as a slurry seal on new or existing (aged) asphalt concrete pavement.

MATERIALS

631-2.1 REFINED COAL TAR EMULSION. A refined coal tar emulsion prepared from a high temperature refined coal tar conforming to the requirements of ASTM D490 for grade 11-12. The use of oil and water gas tar is not allowed. Base refined coal tar emulsion must conform to all requirements of ASTM D5727.

a. Health, safety, and environment. The Contractor must provide a complete Material Safety Data Sheet (MSDS) in accordance with U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations (Standards – 29 CFR, 1910.1200) which establishes the requirement and minimum information for the MSDS for hazardous materials. The MSDS, Section II, shall include the Chemical Abstracts Service (CAS) registry numbers for all applicable hazardous ingredients in the coal tar emulsion product. The Contractor must provide the manufacturer's certification that the product complies with the Code of Federal Regulation (CFR) Title 40 – Protection of Environment. The manufacturer's certification shall address compliance for Air Programs, Part 59, National Volatile Organic Compound Emission Standards for Consumer and Commercial Products (for the airport location) and Water Programs, Part 116, Designation of Hazardous Substances.

631-2.2 AGGREGATE. The aggregate shall be washed dry silica sand or boiler slag free of dust, trash, clay, organic materials or other deleterious substances. The aggregate shall meet the gradation in Table 1, when tested in accordance with ASTM C136.

Table 1. Gradation Of Aggregates*

Sieve Size		Percent Retained	
		Minimum	Maximum
#20 or coarser	(0.850 mm)	0	2
#30	(0.600 mm)	0	12
#40	(0.425 mm)	2	60
#50	(0.300 mm)	5	60
#70	(0.212 mm)	5	60
#100	(0.150 mm)	5	30
#140	(0.106 mm)	0	10
#200	(0.075 mm)	0	2
Finer than #200		0	0.3

* Table 1 represents the maximum range of aggregate gradations. In all cases the refined coal tar emulsion supplier is to give written approval of the aggregate used in the mix design.

631-2.3 ADDITIVE. As specified by the coal tar emulsion manufacturer.

631-2.4 WATER. Water for mixing shall be potable, free of harmful soluble salts, and at least 50°F.

631-2.5 CRACK SEALANT. Crack sealant shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.6 OIL SPOT PRIMER. Oil spot primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

631-2.7 PAVEMENT PRIMER. Pavement primer shall be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the Engineer.

COMPOSITION AND APPLICATION

631-3.1 COMPOSITION. The refined coal tar emulsion seal coat is to consist of a mixture of refined coal tar emulsion, water, additive and aggregate, and be proportioned as shown in Table 2. The composition must have written approval of the coal tar emulsion manufacturer.

631-3.2 QUANTITIES OF MATERIALS PER SQUARE YARD. The Contractor shall submit the recommended formulation of water, emulsion, aggregate and application rate proposed for use to a testing laboratory together with sufficient materials to verify the formulation at least **5** days prior to the start of operations. The mix design shall be within the range shown in the below table. No seal coat shall be produced for payment until a mix has been approved by the Engineer. The formulation shall pass the fuel resistance test in Addendum A.

The mix for each mixture shall be in effect until modified in writing by the Engineer.

Table 2. Composition Of Mixture Per 100 Gallons Of Refined Coal Tar Emulsion

Application	Refined Coal Tar Emulsion Gallons	Water Gallons	Additive Gallons	Aggregate Pounds	Formula Rate of Application of Mix per Square Yard	
					Minimum Gallons	Maximum Gallons
Prime Coat (where required) as specified by the coal tar emulsion manufacturer						
1st Seal Coat	100	25-70	2-6	300-700	0.12	0.20
2nd Seal Coat	100	25-70	2-6	300-700	0.12	0.20

631-3.3 APPLICATION RATE. Application rates are not to exceed 0.20 gal/yd^2/coat and at no time are total coats to exceed 0.51 gal/yd^2

631-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of mixture in the proportions shown in the approved mix design. The amount of mixture shall be sufficient to place a test section a minimum of 250 square yard at the rate specified in the job mix formula. The test area will be designated by the Engineer on a representative section of the pavement to be seal coated. The actual application rate will be determined by the Engineer during placement of the test section and will depend on the condition of the pavement surface.

The test section shall be used to verify the adequacy of the mix design and to determine the application rate. The same equipment and method of operations shall be used on the test section that will be used on the remainder of the work.

If the test section should prove to be unsatisfactory, the necessary adjustments to the job mix formula, mix composition, application rate, placement operations, and equipment shall be made. Additional test sections shall be placed and evaluated, if required. Full production shall not begin without the Engineer's approval. Acceptable test sections shall be paid for in accordance with paragraph 631-7.1.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying test areas and/or test sections to determine the optimum application rate of both emulsion and sand.

CONSTRUCTION METHODS

631-4.1 WEATHER LIMITATIONS. The seal coat shall not be applied when the surface is wet or when the humidity or impending weather conditions will not allow proper curing. The seal coat shall be applied only when the atmospheric or pavement temperature is 50°F and rising and is expected to remain above 50°F for 24 hours, unless otherwise directed by the Engineer.

631-4.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Distributors. Distributors or spray units used for the spray application of the seal coat shall be self-propelled and capable of uniformly applying 0.12 to 0.55 gallons per square yard of material over the required width of application. Distributors shall be equipped with removable manhole covers, tachometers, pressure gauges, and volume-measuring devices.

The mix tank shall have a mechanically powered, full-sweep, mixer with sufficient power to move and homogeneously mix the entire contents of the tank.

The distributor shall be equipped with a positive placement pump so that a constant pressure can be maintained on the mixture to the spray nozzles.

b. Mixing equipment. The mixing machine shall have a continuous flow mixing unit capable of accurately delivering a predetermined proportion of aggregate, water, and emulsion, and of discharging the thoroughly mixed product on a continuous basis. The mixing unit shall be capable of thoroughly blending all ingredients together and discharging the material to the spreader box without segregation.

c. Spreading equipment. Spreading equipment shall be a mechanical-type squeegee distributor attached to the mixing machine, equipped with flexible material in contact with the surface to prevent loss of slurry from the spreader box. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; coal tar emulsion and aggregate build-up on the box shall not be permitted.

d. Hand squeegee or brush application. The use of hand spreading application shall be restricted to places not accessible to the mechanized equipment or to accommodate neat trim work at curbs, etc. Material that is applied by hand shall meet the same standards as that applied by machine.

e. Calibration. The Contractor shall furnish all equipment, materials and labor necessary to calibrate the equipment. It shall be calibrated to assure that it will produce and apply a mix that conforms to the job mix formula. Commercial equipment should be provided with a method of calibration by the manufacturer. All calibrations shall be made with the approved job materials prior to applying the seal coat to the pavement. A copy of the calibration test results shall be furnished to the Engineer.

631-4.3 PREPARATION OF ASPHALT PAVEMENT SURFACES. Clean pavement surface immediately prior to placing the seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface

film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with paragraph 101-3.6.

631-4.4 MIXING. Blend the coal tar emulsion mixture in the equipment described in paragraph 631-4.2 using the ingredients described in Table 2. The mixing must produce a smooth homogeneous mixture of uniform consistency. (Consult coal tar emulsion supplier for its recommended order of addition of the ingredients.) During the entire mixing and application process, no breaking, segregating or hardening of the emulsion, nor balling or lumping of the sand is to be permitted. Continue to agitate the seal coating mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application.

Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the specified amount.

631-4.5 APPLICATION OF SLURRY SEAL SURFACE TREATMENT. The aggregate filled slurry seal surface treatment shall be applied at a uniform rate determined in paragraph 631-3.3.

In order to provide maximum adhesion, the pavement shall be dampened with a fog spray of water if recommended by the supplier. No standing water shall remain on the surface.

If a prime coat is required, mix and apply the prime coat as specified in paragraph 631-4.3.

Apply the first coat uniformly to obtain the rate determined in paragraph 631-3.3.

Each coat shall be allowed to dry and cure initially before applying any subsequent coats. The initial drying shall allow evaporation of water of the applied mixture, resulting in the coating being able to sustain light foot traffic. The initial curing shall enable the mixture to withstand vehicle traffic without damage to the seal coat.

Apply the second coat in the same manner as outlined for the first coat.

Additional coats shall be applied over the entire surface as directed by the Engineer.

The finished surface shall present a uniform texture.

The final coat shall be allowed to dry a minimum of eight hours in dry daylight conditions before opening to traffic, and initially cure enough to support vehicular traffic without damage to the seal coat.

Where marginal weather conditions exist during the eight hour drying time, additional drying time shall be required. The length of time shall be as specified by the supplier. The surface shall be checked after the additional drying time for trafficability before opening the section to vehicle traffic.

Where striping is required, the striping paint used shall meet the requirements of P-620, shall be compatible with the seal coat and as recommended by the coal tar emulsion manufacturer.

QUALITY CONTROL

631-5.1 CONTRACTOR'S CERTIFICATION. The Contractor shall furnish the manufacturer's certification that each consignment of emulsion shipped to the project meets the requirements of ASTM D5727, except that the water content shall not exceed 50%. The certification shall also indicate the solids and ash content of the emulsion and the date the tests were conducted. The certification shall be delivered to the Engineer prior to the beginning of work. The manufacturer's certification for the emulsion shall not be interpreted as

a basis for final acceptance. Any certification received shall be subject to verification by testing samples received for project use.

The Contractor shall also furnish a certification demonstrating a minimum of three years of experience in the application of coal tar emulsion seal coats.

631-5.2 INSPECTION. The Contractor shall have an independent technical consultant on the job site at the beginning of operations for application of coal tar emulsion seal coats. The consultant shall have knowledge of the materials, procedures, and equipment described in this specification and shall assist the Contractor regarding proper mixing of the component materials and application of the seal coat. The consultant shall have a minimum of three (3) years of experience in the use of coal tar seal coats.

Documentation of this experience shall be furnished to the Engineer prior to the start of operations. The cost of the technical consultant shall be paid for by the Contractor.

631-5.3 SAMPLING. A minimum of one sample per day shall be tested for the properties of Table 2. A random sample of approximately one-quart of the composite mix will be obtained daily by the Contractor and stored in a glass container. The containers shall be sealed against contamination and retained in storage by the Owner for a period of six months. Samples shall be stored at room temperature and not be subjected to freezing temperatures.

A sample of undiluted coal tar emulsion shall be obtained from each consignment shipped to the job.

631-5.4 ENGINEER'S RECORDS. The Engineer will keep an accurate record of each batch of materials used in the formulation of the seal coat.

METHOD OF MEASUREMENT

631-6.1 The refined coal tar emulsion with additives shall be measured by the gallon. Only the actual quantity of undiluted refined coal tar emulsion with additives will be measured for payment.

631-6.2 Aggregate shall be measured by the ton of dry aggregate.

BASIS OF PAYMENT

631-7.1 Payment shall be made at the contract unit price per square yard for the refined coal tar emulsion with additives ~~and at the contract price per ton for aggregate~~.

These prices shall be full compensation for furnishing all materials, preparing, mixing, and applying these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat - per Square Yard

TESTING REQUIREMENTS

29 CFR Part 1910.1200 Hazard Communication

ASTM C67 Standard Test Method for Sampling and Testing Brick and Structural Clay Tile

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D5727	Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type)

MATERIAL REQUIREMENTS

ASTM D490	Standard Specification for Road Tar
ASTM D692	Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
ASTM D3699	Standard Specification for Kerosene
ASTM D4866	Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formations Containing Mineral Aggregates and Optional Polymeric Admixtures

END OF ITEM P-631

ADDENDUM A

ITEM P-631 FUEL RESISTANCE TEST AND CRITERION

1. **Scope**

This method determines the resistance of the coal tar emulsion seal coat to kerosene.

2. **Apparatus**

2.1. Two 6" □□6" square 16 gauge sheet metal masks with a 4" □□4" square center removed

2.2. 6" □□6" unglazed white ceramic tile with an absorption rate of 10- 18% (determined in accordance with ASTM C67

Brass ring, 2" diameter and 2" high

2.3. Kerosene meeting requirements of ASTM D3699

2.4. Silicone rubber sealant

3. **Procedure**

3.1. Immerse the ceramic tile in distilled water for a minimum of ten minutes.

3.2. Remove excess water from the tile to produce a damp surface before applying the seal coat.

3.3. Using the mask described in 2.1 apply one layer of the coal tar emulsion mixture to the tile. Spread even with the top of the mask using a spatula or other straightedge.

3.4. Allow the sample to cure for 96 hours at 77 ±2°F. and 50 ±10% relative humidity.

3.5. Position a second mask on top of the first mask.

3.6. Apply a second coat of coal tar emulsion mixture. Spread even with the top of the second mask.

3.7. Cure as in step 3.4.

3.8. After curing, affix the brass ring to the seal coat on the tile with silicone rubber sealant.

3.9. Fill the brass ring with kerosene.

3.10. After 24 hours, remove the kerosene from the brass ring, blot dry and immediately examine the film for softness and loss of adhesion. Immediately after the film is examined, break the tile in half, exposing that part of the tile whose film was subjected to the kerosene.

3.11. Evaluate for penetration of kerosene through the sealer and loss of adhesion.

4. **Report**

Report the results as pass or fail. Visible evidence of leakage or discoloration shall constitute failure of the fuel resistance test.

5. **Criterion:** A "pass" rating in the fuel resistance test is required prior to full production.

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ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding *fertilizing, and watering* the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

MATERIALS

901-2.1 SEED The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb/acre (or lb/1,000
Green Sprangletop	*	*	**0.3**
Bermudagrass	*	*	**15.0**
Sideoats Grama (Haskell)	*	*	**4.5**

Seeding shall be performed during the period between **January 15** and **May 15** inclusive, unless otherwise approved by the Engineer.

~~**901-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [ ] All liming materials shall conform to the requirements of ASTM C 602.~~

901-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be ***30-30-30*** commercial fertilizer and shall be spread at the rate of **150 pounds per acre.**

901-2.4 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and before applying fertilizer ~~and ground limestone~~, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer ~~and ground limestone~~, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be *completely eradicated by means of herbicide or tillage* ~~cut or otherwise satisfactorily disposed of~~, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 DRY APPLICATION METHOD.

~~**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.~~

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 WET APPLICATION METHOD.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb / sq inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 MAINTENANCE OF SEEDED AREAS. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

Watering of the seeded areas shall be coordinated with the Owner and Airport Operations. Contractor will not be permitted to enter the airport secure areas to water without advanced approval.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units **acres** measured on the ground surface, completed and accepted. *Seeding shall be measured to the nearest tenth (0.1) of an acre. Fertilizer and watering will not be measured for separate payment but will be considered subsidiary to seeding.*

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per **acre** or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-1	Seeding, Including Fertilizing and Watering - per acre

MATERIAL REQUIREMENTS

ASTM C 602	Agricultural Liming Materials
ASTM D 977	Emulsified Asphalt
FED SPEC JJJ-S-181	Seeds, Agriculture

END OF ITEM T-901

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ITEM T-904 SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

904-2.1 SOD. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. ~~At least 70% of the plants in the cut sod shall be composed of the species stated in the Texas Department of Transportation Standard Specifications, – *Sodding* special provisions, and~~ *Sod may be either of Bermuda grass or buffalo grass.* Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the ~~special provisions.~~ *Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, Item 162. Sod must be free from noxious weeds, Johnson grass, seed producing grasses, or any other matter deleterious to the growth and subsistence of the sod.*

~~**904-2.2 LIME.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of [___]. All liming materials shall conform to the requirements of ASTM C602.~~

904-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be standard commercial fertilizer and shall be spread at the rate *dictated by the representative soils test conducted by the contractor.*

904-2.4 WATER. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

904-2.5 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

904-3.1 GENERAL. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 PREPARING THE GROUND SURFACE. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

904-3.3 APPLYING FERTILIZER AND GROUND LIMESTONE. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches by discing, raking, or other suitable methods. Any stones larger than 2 inches in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 OBTAINING AND DELIVERING SOD. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 LAYING SOD. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch below the pavement edge.
Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 sq inch. The pegs shall be driven flush with the surface of the sod.

904-3.6 WATERING. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.7 ESTABLISHING TURF.

a. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

b. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

c. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

904-3.8 REPAIRING. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be sodded as specified in paragraph 904-3.5.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-1	Sodding - per square yard

MATERIAL REQUIREMENTS

ASTM C 602	Standard Specification for Agricultural Liming Materials

END OF ITEM T-904

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 TOPSOIL. *Topsoil source to be existing topsoil within the limits of the grading as shown on the Plans, and temporarily stockpiling topsoil on the airport property at a location acceptable to the airport and the Engineer.* Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. ~~The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117.~~*~~Topsoil testing shall be completed and paid for by the Contractor.~~*

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 INSPECTION AND TESTS. Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 GENERAL. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 PREPARING THE GROUND SURFACE. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of

capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 PLACING TOPSOIL. The topsoil shall be evenly spread on the prepared areas to a uniform depth of inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil obtained on the site shall be measured by the ***area in square yards of the specified thickness of topsoil re-handled and placed from the topsoil stockpiled under Item P-152-2.10 as accepted by the Engineer. Topsoiling measured for payment shall only be the planned limits of construction.*** ~~number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoiling by the Contractor shall be measured by the number of cubic yards of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

~~**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.~~

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per ~~cubic yard~~ *square yard of the specified thickness* for topsoiling (obtained on the site). This price shall be full compensation for furnishing all materials and for all *stripping and stockpiling topsoil at the airport, hauling,* preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

~~**905-5.2** Payment will be made at the contract unit price per cubic yard for topsoiling (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

Payment will be made under:

Item T-905-1	Topsoiling (Obtained on Site or Removed from Stockpile; 2" Thickness) - per square yard

TESTING MATERIALS

ASTM C 117 Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

END OF ITEM T-905

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ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications, at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 WIND CONES. The primary wind cone assembly shall be Type L-807(L) (Rigid Supporting Structure), Style I-B (Internally Lighted), Size 2 (36" Diameter by 12' Long) meeting the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

107-2.3 ELECTRICAL WIRE AND CABLE. Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

107-2.5 PLASTIC CONDUIT (for use below grade only). Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete.

107-2.7 PAINT

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification - Paint 25, Primer, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

107-3.2 SUPPORT POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTIONS. The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

~~**107-3.4 BOOSTER TRANSFORMER.** If shown in plans or specified in the job specifications, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof housing. The booster transformer shall be installed as indicated in the plans and described in the proposal. If the booster transformer is required for installation remotely from the wind cone, it shall be installed in accordance with and paid for per as described in Item L-109, Airport Transformer Vault and Vault Equipment.~~

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 4 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

107-3.6 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

107-3.7 LIGHT SOURCES. The Contractor shall furnish and install lamps per the manufacturer's instruction book.

107-3.8 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

107-3.9 SEGMENTED CIRCLE. The segmented circle shall be constructed in accordance with AC 150/5340-5, Segmented Circle Airport Marker System, and the details in the Plans.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

107-4.2 The quantity of segmented circle airport marker systems to be paid for shall be the number of systems installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107-5.1	L-807(L), Style I-B, Size 2 Wind Cone and Foundation, in Place – per Each
Item L-107-5.2	Segmented Circle Marker System, in Place – per Each

MATERIAL REQUIREMENTS

AC 150/5340-5	Segmented Circle Airport Marker System
AC 150/5340-30	Design and Installation Details for airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description. Spec A-A-3067	*Paint: Alkyd, Exterior, Low VOC*
Fed. Spec. TT-P-664D	*Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant*
Fed. Spec. W-C-1094	*Conduit and Conduit Fittings, Plastic, Rigid*
FED STD 595	Colors Used in Government Procurement
MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit – Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit - Steel
NFPA-70	National Electric Code (NEC)

END OF ITEM L-107

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ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in Item L-110, Airport Underground Electrical Duct Banks and Conduits.

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual aid Facilities, Table 5-

1 and paragraph 5.1.3.1, with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. ~~Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 [Type B] [Type C], 5,000 volts, nonshielded, with [ethylene propylene insulation] [cross-linked polyethylene insulation].~~ L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for ground wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or an approved equivalent, used for potting the splice is acceptable.

b. The Field-Attached Plug-In Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

c. The Factory-Molded Plug-in Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The Taped or Heat-Shrink Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 TAPE. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 ELECTRICAL COATING. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 EXISTING CIRCUITS. Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be

performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders

shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

(1) When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.

(2) Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 Item.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 inches (75 mm) deep, loose measurement, and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the compaction requirements per Item P-152 for that area shall be followed.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inch (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, and seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep.

At the location of each underground cable connection, except at lighting units, or isolation transformers, or power a concrete marker slab must mark adapters placed above the connection. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

a. Equipotential. – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

b. Isolation – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables.

For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

For raceways installed under pavement; for raceways and cables not installed adjacent to the full strength pavement edge; for fixtures installed in full strength pavement and shoulder pavement ~~and for optional method of edge lights installed in turf (stabilized soils); and for raceways or cables adjacent to the full strength pavement edge~~, the counterpoise conductor shall be centered over the raceway or cable to be protected as described below.

The counterpoise conductor shall be installed no less than 8 inches (203 mm) above the raceway or cable to be protected, except as permitted below.

The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise conductor shall be installed no more than 12 inches (305 mm) above the raceway or cable to be protected.

The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection.

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

c. A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

d. For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

108-3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall include additional quantities required for slack.

~~**108-4.3** Ground rods shall be measured by each [10-foot] section installed complete.~~

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	Trenching for Direct-Buried Cable, 18 Inch Minimum Depth – per Linear Foot
Item L-108-5.2	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit – per Linear Foot
Item L-108-5.3	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.4	No. 1/0 AWG, Stranded, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors – per Linear Foot
Item L-108-5.5	Trenching for Direct-Buried Bare Counterpoise Wire, 8" Minimum Depth – per Linear Foot
Item L-108-5.6	No. 6 AWG Stranded, 600V Rated, Type THHN/THWN-2 Cable, Installed in Duct Bank or Conduit – per Linear Foot
Item L-108-5.7	No. 8 AWG Stranded, 600V Rated, Type THHN/THWN-2, Green Insulated Equipment Ground, Installed in Duct Bank or Conduit – per Linear Foot

MATERIAL REQUIREMENTS

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D33	*Tinned Soft of Annealed Copper Wire for Electrical Purposes*
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive
MIL-P-21035	*Paint High Zinc Duct Content, Galvanizing Repair*

REFERENCE DOCUMENTS

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems
MIL-S-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

~~**110-2.2 STEEL CONDUIT.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10~~

~~mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.~~

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings-shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I – Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II – Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III – HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28-day compressive strength of 3500 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work

progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated

before bidding. All such rock removal shall be performed and paid for under *and subsidiary to the respective trenching or conduit or duct bank pay item.*

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, and seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Non-Encased, Electrical Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.2	Non-Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.3	Non-Encased, Schedule 40 PVC Drain Conduit, 1-Way 2"C – per Linear Foot
Item L-110-5.4	Encased, Electrical Conduit, 1-Way 2"C, with Flowable Fill and Sawcut Pavement Repair – per Linear Foot
Item L-110-5.5	Concrete Encased, Electrical Duct Bank, 2-Way 2"C – per Linear Foot
Item L-110-5.6	FAA-Style, Concrete Encased, Split Duct Conduit, 1-Way 3"C – per Linear Foot

MATERIAL REQUIREMENTS

Advisory Circular (AC) 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NFPA-70	National Electrical Code (NEC)
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit - Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit Steel
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel*. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

~~**115-3.13 MANHOLE ELEVATION ADJUSTMENTS.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.~~

~~The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.~~

~~The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.~~

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections

- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

~~**115-4.2** Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.~~

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	FAA-Style, Precast Concrete Electrical Handhole, Aircraft-Rated, 3'Lx3'Wx3'D, Installed – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	1
Issued (Date):	July 25, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Rescheduled Walk-Throughs & Cut-off Date for Responses to Question Submissions

- **Property Walk-Throughs**

Please note that the original walk-through scheduled for Tuesday, July 25, 2017 *has been rescheduled.* Bidders will now have (2) opportunities to walk-through the airport property and view secured areas of the project, as follows:

Thursday, July 27, 2017 – 10:00 am CDT
Thursday, July 27, 2017 – 1:00 pm CDT

Bidders are to meet at the Jack Brooks Regional Airport, Administration Office (Lobby), 5000 Jerry Ware Blvd., Beaumont, Texas 77705.

This will be the bidder's only opportunity to walk-through the property and view secured areas of the project.

- **Cut-off Date for Responses to Question Submissions**

Bidders must submit technical questions via email to Colin Bible, Project Manager with Garver, LLC. at CMBible@GarverUSA.com **by 5:00 pm CDT, Tuesday, August 1, 2017** in order to receive a response.

Addendum No. 1 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

_____
Witness

_____
Witness

Approved by ____ Date: _____

_____
Authorized Signature (Bidder)

Donna Burke - Senior Project Administrator
Title of Person Signing Above

Triple B Services, LLP
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	2
Issued (Date):	August 2, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Updating DBE Goals, Documenting Pre-Bid Meeting, and Updating existing electrical structure final grades.

- **Updating DBE Goals**

Please find attached the updated DBE Participation Forms. This reflects the new DBE Goals to be met.

- **Documenting Pre-Bid Meeting**

Please find attached the Pre-Bid meeting Agenda and the Pre-Bid meeting sign-in sheet.

- **Updating electrical structure final grades**

Please find attached the electrical drawings for the elevation adjustment of the electrical hand hole. This additional work warranted an update in the L-115 technical specification and pay item (L-115-5.3). The new L-115 specification is attached to this addendum along with the bid form featuring the updated pay item. Furthermore, the FAA-C-1391d specification governing the aforementioned adjustment has been added and so is the updated list of technical specifications.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

_____
Witness

_____
Witness

Approved by ____ Date: _____

_____
Authorized Signature (Bidder)

Donna Burke - Senior Project Administrator
Title of Person Signing Above

Triple B Services, LLP
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: Triple B Services, LLP DBE: ☐ Yes ☐ No

Address: 820 Old Atascocita Rd. Huffman, TX 77336
Street City State Zip

Phone (with area code): 281-324-3264 Fax (with area code): 281-324-1304

Project Title & No.: Jack Brooks Regional Airport - Taxiway D IFB No: 17-024/JW

Prime Contract Amount: $ _____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____ _____ _____
Printed Name of Contractor Representative Signature of Representative Date

_____ _____ _____
Printed Name of DBE Signature of Representative Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Prime Contractor: Triple B Services, LLP DBE: ☐ Yes ☐ No

DBE Status (Gender & Ethnicity): _____

Address: 820 Old Atascocita Rd. Huffman, TX 77336
Street City State Zip

Phone (with area code): 281-324-3264 Fax (with area code): 281-324-1304

Project Title & No.: Jack Brooks Regional Airport - Taxiway D IFB/RFP No.: 17-024/JW

Total Contract: $ _____ Total DBE Subcontract(s): $ _____

Construction DBE Goals: 12.90% DBE:: _____ %

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☐ Other: _____

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☐ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

_____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required**. I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): _____

Title: _____

Signature: _____

Date: _____

E-mail address: _____

Contact person that will be in charge of invoicing for this project:

Name (print or type): _____

Title: _____

Date: _____

E-mail address: _____

Bidder Shall Return Completed Form with Offer.

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

TEL 972.377.7480

www.GarverUSA.com

Jack Brooks Regional Airport – Taxiway D Reconstruction (2017) Ware Ramp to TW 'F' Pre-Bid Meeting

10:00 a.m. July 25, 2017

1) **Introductions & Roles:**
   a) Alex Rupp, Airport Manager, Jack Brooks Regional Airport (Owner)
   b) Duke Youmans, Operations Manager, Jack Brooks Regional Airport
   c) Megan Landry, Finance Manager, Jack Brooks Regional Airport
   d) Jamey West, Assistant Purchasing Agent, Jefferson County
   e) Colin Bible, PE, Senior Project Manager, Garver

2) **Bidding Procedures**
   a) Bids proposals are due no later than 11:00 am local time on August 8, 2016 at the Jefferson County Purchasing Division, 1149 Pearl Street, 1st Floor, Beaumont, Texas 77701. After the cut-off time, bids will be publicly opened and read. DO NOT DELIVER BID PACKAGES TO THE AIRPORT – THEY WILL BE CONSIDERED NON-RESPONSIVE.
   b) Instructions to Bidders. Requirements are detailed in this section.
      i) Bid package consisting of an entire project manual and 3 copies of the required documents
      ii) Vendor registration with System for Award Management
   c) Awarded Vendor requirement for Submission of Form 1295
   d) Bids may be held up to 90 days for FAA funding schedule.
   e) Bid Proposal. Contract Time:
      i) 279 Calendar Days; this is inclusive of typical weather days and holidays.
      ii) $1,000 per day Liquidated Damages thereafter.
      iii) Section K identifies included typical weather days per month.
   f) Contract Award

Base Bid – Taxiway D Reconstruction (2017)

3) **Federal Provisions**
   a) The DBE goal is **12.90%**.
      i) Questions regarding goals and good faith efforts should be directed to Megan Landry at the airport.

4) **FAA General Provisions**
   a) 7/21/2014 version of the provisions are included in the project manual portion of the bid documents.
   b) Section 110 covers the calculation of "Percent Within Limits" for concrete pavement pay factors.

5) **Plans and Technical Specifications**
   a) Plansheets G-301 to G-305 for phasing plan and requirements. This project will close Runway 12/30 and Runway 16/34 during overnight hours and to non-commercial traffic during a 2-day period at the beginning of construction. Remaining project work will be done with the runway open to all traffic.
   b) Safety Plan Compliance Document SS-101 – this is a document requirement for working on the airfield.
   c) Concrete Pavement P-501 – this specification has been modified to allow side-form construction
   d) Subbase Course P-154 – for foundation beneath the concrete pavement
   e) Lime-Treated Subgrade – for foundation beneath the subbase course. A 6% dosage rate; 16" depth is anticipated to be windrowed in 2 lifts
   f) Refined Coal Tar Emulsion with Additives – Coating the ware ramp.
   g) Airport Lighting Systems SS-310 – for LED taxiway lighting fixtures

6) **Construction Security**
   a) Security background checks and driver training. These are to be provided by the Contractor at his own expense for employees that will be driving on the airfield.
7) **General Discussion / Question and Answer**

1776

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room
Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Shawn Thurman	SpawGlass	409-681-4547	Shawn.thurman@spawglass.com
JD Burns	Electrical Specialties Inc.	409-860-5211	jd@esibmt.com
Justin Burns	Electrical Specialties Inc	(409) 860-5211	Justin@ESIBMT.com
Doug Stanton	Kwest Group	972 722 3874	DougStanton@KwestGroup.com
Brenda Baker	Hartmann Building	409-659-8225	bbaker@hbs[illegible].net
Duke Youmans	JBRA	409-719-4950	dyoumans@co.jefferson.tx.us
Megan Landry	JBRA	409-719-4900	MLANDRY@co.Jefferson.TX.US
Clovis Restrepo	Ez Demolitions/Underground	(2)827-3673	cr@ezdemolitions.com
Javier Castro	Ez Demolition Inc	713)560-7215	javier@ezdemolitions.com

1777

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Arlie Tucker	Gulf Coast	409-284-2598	gwtucker@gpix.com
Bill Kelley	Martin Marietta	409-658-7791	William.Kelley@martinmarietta.com
Mike Kelley	MK Constructors	409-769-0089	Sales@MKconstructors.com
Brandon Harrison	Alico	409-860-4459	bharrison@alico.com
Blake Heisler	Brystar Contracting Inc	409-842-6768	ron@brystar.com

1778

Jack Brooks Regional Airport Taxiway D Reconstruction (2017)
Airport Administration Conference Room

Pre-Bid meeting
July 25, 2017, 10:00am

SIGN-IN SHEET

Name	Representing	Phone #	Email
James West	Jefferson Cty. Purchasing	409-835-8693	jwest@co.jefferson.tx.us
Rodney White	Texas Premier Services, LLC	409.782.4151	RWhiteTPS@Gmail.com
Matt Myers	Holes Companies	409-658-0108	Matt@holesinc.com
Lee Aitken	Holes Companies	281-898-1761	Lee@Holesinc.com

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall be per the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft

wheel loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable; reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum *aircraft wheel* load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

~~**115-2.7 LADDERS.** Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, ½ inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 Mpa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece copper clad *steel.* The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

~~**115-3.5 INSTALLATION OF LADDERS.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.~~

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the

top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 MANHOLE ELEVATION ADJUSTMENTS. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall ~~reinstall the manhole top section or ring and cover on top~~ *install a new manhole frame and lid as shown on the plans* and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit:

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding

- All Required Connections
- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

Item L-115-5.1	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 12" Diameter by 24" Depth – per Each
Item L-115-5.2	Concrete Encased Electrical Junction Structure, L-867 Class 1, Size 16" Diameter by 24" Depth – per Each
Item L-115-5.3	Adjust Manhole to New Grade – per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
Advisory Circular (AC) 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

FAA-C-1391d
September 2014
SUPERSEDING
FAA-C-1391c
May 2012

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION SPECIFICATION

INSTALLATION, TERMINATION, SPLICING, AND TRANSIENT/SURGE PROTECTION OF UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM POWER CABLES

This specification is approved for use by all Departments of the Federal Aviation Administration (FAA)

FOREWORD

1. This specification provides requirements for the installation of FAA-owned and maintained underground electrical line distribution (ELD) systems in support of FAA facilities. The ELD systems include power cable and associated components on the exterior, commercial power supply side of the circuit at the airfield or remote site through to the service entrance power panels of FAA facilities.

2. This specification applies only to FAA medium-voltage (MV) and low-voltage (LV) underground power cables, and to a limited extent to overhead lines that may form a part of an FAA-owned circuit. It does not apply to control, telecommunication, or facility service entrance (load side) wiring. For standards pertaining to these non-power cable and electrical systems, consult the appropriate office of primary responsibility for applicable standards.

3. Power for airfield lighting cables has a separate set of standards and procedures. Refer to the appropriate FAA Advisory Circular (AC) 150/5340 and associated governing standards.

4. This is an update to an existing specification. It assimilates recent utility industry knowledge concerning ELD systems, with the aim of providing safer, more reliable FAA underground MV and LV ELD systems.

5. Changes in this version of the document include (see change history, page iv):

   a. Revised from "c" version to "d" version.
   b. Miscellaneous updates collected from field comments.
   c. Submittals section updated; submittals matrix added as an appendix.
   d. Duct joining processes added, with special consideration of joining HDPE sections (see also appendix for sample bonding adhesives data sheet).
   e. Product section updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings, etc).

6. This specification is intended to ensure that minimum FAA requirements are met based on current commercial practices relating to safety, reliability, and restorability of FAA electrical line distribution systems. Contractors are encouraged to provide innovative, best-value solutions wherever possible within the bounds of these requirements.

Comments, suggestions, or questions on this document should be addressed to: Federal Aviation Administration, AJW-22, Power Services Group, Power Cable Program, 800 Independence Ave., S.W., Washington, DC 20591, https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/atc_facilities/power_services/power_cable/

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10/30/14
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Change History

1. Originator Name and Address AJW-22, Power Services Group	2. [] Proposed	3. Code Identification	4. Document No. FAA-C-1391c
Washington, DC	[X] Approved	5. Code Identification	6. DCN No.
7. System Designation	8. Related ECR/NCP No. ATO0W-CABLE-1023	9. Contract No.	10. Contractual Activity N/A
11. Product Integration Plan		12. Effectivity	

This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with non-listed pages of the original issue of the revision shown in block 4, constitute the current version of this specification.

13. DCN No.	14. Pages changed	S*	A/D*	15. Date
	Summary - general: a. Deletion of requirements for non-electrical-line-distribution (non-ELD) systems, including communications and telecommunications cables (both copper and FOTS), control cables, and constant-current-regulated runway approach and edge lighting power cables. Basic separation requirements between ELD and non-ELD cables have been retained. Installation standards and specifications for the non ELD systems may be found by consulting the appropriate office of primary responsibility. b. Emphasis on product changes in FAA ELD systems from the older 2.4 kV to 4.16 kV distribution circuits to the newer industry standard medium voltage systems, e.g., 3-phase/7200 V (phase to neutral). The Power Cable Program favors 15 kV rated cables and equipment to bring FAA ELD systems up to compatibility with the utility industry and to meet future FAA needs. c. Increased attention to the protection of sensitive internal constituent parts of MV cable systems during installation, by (1) the imposition of stringent tests meeting IEEE criteria, and (2) using proper cable pulling, splicing, and terminating techniques. d. Addition of power cable acceptance testing process for newly installed cables (text main body and Appendix C). Acceptance tests classified as destructive by the IEEE, such as the DC high potential (HIPOT) test, shall no longer be performed on in-service power cables. e. Treatment of the qualifications of MV "qualified persons" during installations.			1/24/2012
	Details – changes: a. Non ELD systems, deletions from FAA-C-1391b version: pp. 1-4, 7-15, 17-19. Sections/paragraphs affected: 2.1.2, 2.1.3, 3.1.2, 3.2.1, 3.2.2, 3.4, 3.4.1.1, 3.4.1.2, 3.4.2.2, Table I, 3.4.3, 3.4.3.1, 3.4.4, 3.4.5, 3.5.1, 3.5.2, 3.6, 4.2, 4.3, 4.5, 4.5.1, 4.5.2, 4.6, 4.6.1, 4.6.2, 4.6.3, App A.			1/24/2012
	Details – changes: b. Product changes, additions in FAA-C-1391c: cable 3.3.6.2; 15 kV surge protection 5.8.2; 15 kV splice kits 5.9.			1/24/2012
	Details – changes: c. Installation of cables, additions in FAA-C-1391c: splice procedures 5.9; cable pulling 5.5.12 and App B; cable end sealing 5.5.11; installer qualifications 3.3.3.2; 50/60 Hz offline partial discharge test 3.3.6.3, 3.3.6.4.			1/24/2012
	Details – changes: d. Acceptance testing procedures, additions in FAA-C-1391c: 3.3.6; Appendix C.			1/24/2012
	Details – changes: e. Qualified persons and contractors, change in FAA-C-1391c: 3.3.3 (all), 3.3.6.4, 5.9.			1/24/2012
	Updated document from "c" version to "d" version.			4/4/2014
	Miscellaneous updates collected from field comments.			4/4/2014
	Submittals updated, products updated (added power cable, transformers, switchgear/sectionalizers, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings).			4/4/2014
	Manhole cover wheel loading and guard wire grounding upgraded.			8/15/14

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1. SCOPE

This specification defines the minimum requirements for the installation of medium voltage and low voltage (600 V) electrical line distribution (ELD) power cables buried directly in the earth or installed in underground duct or conduit. The industry definition of medium voltage is between 600 V and 34,500 V nominal voltage line to ground. The work includes surveying, trenching, and backfilling, installation of cables, conduits, concrete-encased ducts, hand holes, manholes, duct markers, joints and splicing, terminating, providing surge protection, and testing of cables for acceptability of the finished ELD. In addition, this specification defines the responsibilities of the contractor with respect to safety, quality assurance, and quality control during the installation and testing of ELD systems.

This specification covers installation and acceptance testing of FAA ELD systems only. For FAA power cable maintenance directives, refer to FAA Order 6950.22.

This specification applies to installation of medium and low voltage facility electrical supply power cables and associated equipment only. These systems provide facility power from the power supplier's primary service to the service entrance power panels of FAA facilities. For detailed information on the installation of non-ELD cable systems such as control cables, fiber optics telecommunication (FOTS) cables, communication cables, etc., consult with the office of primary responsibility (OPR) for guidance. The 2400-V shielded constant current power cables serving runway edge lighting fixtures have their own standards and are not the subject of this specification. Consult the appropriate office of primary responsibility and the airport circulars for guidance. For basic separation requirements of FAA utility power cable systems from non-electrical-power cable systems, consult the section of this specification entitled, "Separation of Cables" (5.5.10). When physically integrating non-ELD cables with power cables, do not assume all of the provisions of FAA-C-1391 apply without first coordinating with the appropriate OPR and the FAA onsite project engineer responsible for integration of multiple cable assets.

Non-ELD OPRs consist of:

a. **AJW-45 Ground-Based Navaids Group,**
b. **AJW-46 Lighting Systems Group,**
c. **AJW-52 Communications Systems Engineering Group,**
d. **AJW-53 Telecommunication Services Group,**
e. **AJW-55 Air-Ground Data Communications Group,**
f. **AJW-56 Air-Ground Voice Communications Group,**
g. **Others (as applicable).**

2. APPLICABLE DOCUMENTS

2.1 General

Due to the continuous updating of Government documents, the FAA Contracting Officer and/or the FAA Project Engineer must specify the document version and publication date current at the time of contract award or project design. The documents below form a part of this specification. Some of the FAA documents listed are out of date but are still applicable; reference the notations next to each reference provided. FAA tailoring organizations should consult with the offices of primary responsibility to obtain the most recent applicable documentation.

2.2 Order of precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Government documents

The following citations are government documents that are used as references in this specification.

2.3.1 FAA orders, standards, specifications, and handbooks

The following FAA orders, standards, specifications, and handbooks form a part of this document to the extent specified herein. Unless otherwise stated, requirements contained in these documents are as cited in the project solicitation or contract. (Copies of FAA orders, standards, specifications, handbooks, drawings, and other applicable FAA documents may be obtained from the Contracting Officer issuing the invitation-for-bids or request-for-proposals. Requests should fully identify the material desired; for example: specification, standard, amendment, drawing numbers [drawings possessing standard FAA signature block], and dates. Requests should cite the invitation for bids, request for proposals, the contract involved, or other source of the requested material.)

2.3.1.1. ORDERS

JO 3900.XX	Air Traffic Organization Electrical Safety Program [Future]
JO 6750.16	Siting Criteria for Instrument Landing Systems
JO 6950.27	Short Circuit Analysis and Protective Device Coordination Study [contact PSG Systems Engineering for arc flash calculations]

2.3.1.2 STANDARDS

FAA-STD-XXX	Underground Electric Line Distribution (ELD) Systems [Future]
FAA-STD-019	Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities

2.3.1.3 ADVISORY CIRCULARS AND SPECIFICATIONS

150/5300-13	Airport Design
150/5320	Surface Drainage Design
150/5370	FAA Standards for Specifying Construction of Airports
FAA-E-113	Poles, Wood, Treated
FAA-E-2793	Cable, Electrical Power, 2,000 to 35,000 Volts
FAA-E-2013	Cable, Electrical Power, Exterior 600 Volts

2.3.1.4 HANDBOOKS

FAA-HDBK-XXX	Underground Electric Line Distribution (ELD) Systems [Future]

2.3.2 Other Government documents, drawings, and publications

The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American Association of State Highway & Transportation Officials Specifications

AASHTO HB-17	Standard Specifications for Highway Bridges.
AASHTO HS-20	Standard Specifications for Highway Bridges

Occupational Safety and Health Administration Codes

Part 1926	Safety and Health Regulations for Construction.

Military Specifications

MIL-I-3825	Insulating Tape, Self-Fusing
DLA A-A-50563	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
DLA A-A-59213	Splice Connectors
DLA A-A-59214	Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated with Corrosion-Resistant Finish)
DLA A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
DLA A-A-59551	Wire, Electrical, Copper (Uninsulated)
Navy A-A-59827	Topside Conduit (Flexible) and Conduit fittings, Electrical: Composite Based (Non-metallic)
UFC 3-350-03FA	Electrical Power Supply and Distribution
UFC 3-600-01	Fire Protection Engineering for Facilities
UFGS 26 12 19.20	Single-Phase Transformers
UFGS 26 12 19.10	Three-Phase Transformers
UFGS 33 70 02.00 10	Electrical Distribution System, Underground

Federal Specifications

W-C-375/3	Circuit Breakers, Molded Case; Branch Circuit and Service
W-S-865	Switch, Box (Enclosed), Surface Mounted
WW-C-566	Conduit, Metal, Flexible
WW-C-581	Class 1 Type A with Standard for Electrical Rigid Metal Conduit - Steel, UL 6

2.4 Non-Government publications

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American National Standards Institute (ANSI) Standards

ANSI 6	Standard for Rigid Metal Conduit. (Same as UL 6)
ANSI 467	Standard for Grounding and Bonding Equipment. (Same as UL 467)
ANSI 514	Fittings for Cable and Conduit. (Same as UL 514)
ANSI 651	Schedule 40 and 80 Rigid PVC Conduit. (Same as UL 651)
ANSI A14.3	Safety Code for Fixed Ladders
ANSI C2	National Electrical Safety Code (NESC). (Same as IEEE C2)
ANSI C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV). (Same as IEEE C62.11)
ANSI C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits. (Same as IEEE C62.22)
ANSI C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems (Same as IEEE 1299/C62.22.1)
ANSI C62.41	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits. (Same as IEEE C62.41)
ANSI C80	Rigid Steel Conduit – Zinc Coated. (Same as NEMA C80)
ANSI C119.1	Sealed Insulated Underground Connector System Rated 600 Volts. (Same as NEMA C119.1)
ANSI FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies. (Same as NEMA FB1)
ANSI RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit. (Same as NEMA RN 1)
ANSI S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV (Same as ICEA S-97-682-2007)

ANSI TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation. (Same as NEMA TC 6 & 8)
ANSI Z535	Safety Alerting Standards. (Same as NEMA Z535)

American Society of Civil Engineers Standards

CI/ASCE 38-02	Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

American Society for Testing & Materials (ASTM) Standards

ASTM A48	Standard Specification for Gray Iron Castings.
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors
ASTM C267-97	Standard Test Methods for Chemical Resistance of Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C478	Standard specification for Precast Concrete Manhole Section (AASHTO No. M199)
ASTM C579-96	Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C580-93	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM C990	Standard Specification for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1056	Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D2444-93	Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM F512	Standard Specification for Smooth-wall PVC Conduit and Fittings for Underground Installation
ASTM 1962	Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles
ASTM F2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit

Institute of Electrical and Electronics Engineers (IEEE) Standards

IEEE C2	National Electrical Safety Code (NESC)
IEEE-48	Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE-100	The Authoritative Dictionary of IEEE Standards Terms
IEEE-386	Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600V
IEEE-400.2	IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE-400.3	Guide for Partial Discharge Testing of Shielded Power Cables in a Field Environment
IEEE-404	Standard for Power Cable Joints
IEEE-525	Cable Systems in Substations
IEEE-835	Power Cable Ampacity Tables
IEEE C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).

IEEE C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits
IEEE 1299/C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems
IEEE C62.41 (Formerly IEEE 587)	Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits

Insulated Cable Engineers Association (IECA) Standards

ICEA S-94-964	Concentric Neutral Cables Rated 5-46 kV
ICEA S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV

International Electrotechnical Commission (IEC) Standards

IEC 60071-2	Insulation coordination Part 2: application guide.

National Electric Manufacturers Association (NEMA) Standards

RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit
FB1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
TC 2	Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 AND EPC-80)
TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation
TC 7	Smooth-Wall Coilable Electrical Polyethylene Conduit
TC 9	Fittings for PVC Plastic Utilities Duct for Underground Installation
TC 14	Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
NECA/NEMA 605	Recommended Practice for Installing Underground Nonmetallic Utility Duct

Underwriters' Laboratories (UL) Inc. Standards

UL 6	Standard for Rigid Metal Conduit
UL 467	Standard for Grounding and Bonding Equipment
UL 514	Fittings for Cable and Conduit
UL 651	Schedule 40 and 80 Rigid PVC Conduit

National Fire Protection Association (NFPA) Standards

NFPA-70	National Electric Code (NEC)
NFPA-70E	Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems
NEC Hdbk	Art. 110.16, Flash Protection
NEC Hdbk	Art. 344.10, Rigid Metal Conduit: Type RMC
NEC Hdbk	Art. 280, Surge Arrestors, Over 1 kV

3. GENERAL

3.1 Definitions

Unless otherwise specified, electrical and electronics terms used in this specification, and on the drawings, shall be as defined in IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*.

In the text of this specification, the words "conduit" and "duct" are sometimes used interchangeably and have the same meaning.

In the text of this specification, "medium voltage cable splices" and "medium voltage cable joints" are used interchangeably and have the same meaning.

For the purposes of this specification, "FAA electrical line distribution systems (ELD)" shall be defined as:

FAA owned and operated electrical power distribution systems (underground or overhead) running from a power source to FAA facility load(s). An ELD may include some or all of the following: power cable; transformers; sectionalizers; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Intra-facility wiring, runway edge lighting cables, and FOTS and system cables, such as MALSR or ALSF loop cables are not included as part of ELD.

The demarcation point between an FAA ELD system and FAA facility premises wiring on an airport can be ambiguous. When in doubt, consult AJW-22, Power Services Group, Power Cable Program.

3.2 Submittals

Submittals are limited to those necessary for quality control (see Appendix E). Submittals marked A are required. For submittals marked B or C, the FAA task or contract specifier shall evaluate the contract for each kind, voltage, or type of submittal used on the project and make a determination as to whether the submittal is required. Examples given are not limited to those shown in parentheses:

"A" indicates that the submittal is required.

"B" indicates that the submittal is required, unless specifically deleted by the contract specifier.

"C" indicates that a submittal is not generally required because it is expensive and/or time consuming (i.e., a special case). If the submittal is required, the contract specifier shall show the required submittal on the submittals matrix (Appendix E) and in the contract documents (as a CLIN item).

a. Contractor-generated design data (ANSI C2 and FAA-STD-032, Para 3.1.13)
   1. Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2) [A]
   2. Design assumptions and parameters (FAA-STD-032) [B]
   3. Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc) [C]
   4. Design calculations (FAA-STD-032) [A]
   5. Contractor-generated design drawings or sketches. [A]
b. Cost estimates [A]
c. Medium voltage cable [A]
d. Medium voltage cable splices and joints* [A]
e. Medium voltage cable terminations* [A]
f. Conduits [A]
g. Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc) [A]
h. Switch pads and sectionalizers [A]
i. Transfer switches (automatic and manual) [A]
j. Transformers [A]
k. Surge arresters [A]
l. Live end caps or protective caps [A]
m. Precast concrete structures [A]
n. Sealing Material [B]
o. Manhole frames and covers [A]
p. Hand hole frames and covers [A]
q. Cable supports (racks, arms and insulators) [A]
r. Protective devices and coordination study [A]
s. As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system. [A]
t. Electrical equipment factory test reports [A]
   1. Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13). [A]
   2. Transformers [A]
   3. Switchgear, sectionalizers [A]
   4. Disconnects [A]
   5. Other applicable components [B]
u. Field acceptance checks and tests (see Appendix C) [A]
v. Arc-proofing test for cable fireproofing tape [C]
w. Cable installation plan and procedure (use cable installation plan only when pulling cable between manholes; do not use for pulling from pole riser to manhole only):
   1. Site layout drawing with cable pulls numerically identified [B]
   2. A list of equipment used, with calibration certifications [A]
   3. The manufacturer, type, and quantity of lubricant used on pull [B]
   4. The cable manufacturer and type of cable [A]
   5. The dates of cable pulls, time of day, and ambient temperature [C]
   6. The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table cable pulls may be submitted. [A]

7. The actual cable pulling tensions encountered during pull [A]
8. Certificates (tensiometer calibration, VLF tester calibration, etc) [A]

x. Cable splicer/terminator qualifications* [A]
y. Cable installer qualifications* [A]
z. Project design drawings [A]

*Note: The contractor shall provide the product drawings showing details of the connecting methods to be used, and a statement of the experience of the contractor in making connections on underground systems with the proposed product. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable. Products shall meet the latest editions of applicable standards as follows:

APPLICATION STANDARD (USE LATEST ISSUED)	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

3.3 Quality assurance

All work shall comply with the National Electrical Code (NEC) and IEEE C2/National Electrical Safety Code (NESC) for components and installation. To the maximum extent practicable, furnish products that are listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environment in which the products are installed. Use of nonlisted components will not be allowed unless (1) it is demonstrated that listed components are not available, and (2) the FAA preapproves such components before installation. Approval shall be at the discretion of the FAA.

3.3.1 Quality plan

The contractor shall submit a Quality Plan in compliance with ISO 9001, *Quality Management Systems Requirements*. This plan will allow the FAA to identify the stages at which the FAA requires carrying out an inspection or witnessing a test. The plan shall cover all relevant stages of personnel qualification, design, coordination, supplier selection, manufacturers' acceptance testing, site inspection, site quality control testing, and commissioning. The plan shall identify relevant suppliers by name, components supplied, country of origin, and whether suppliers and supplied components are quality assurance certified.

3.3.2 Quality control

The quality of the equipment installed shall be controlled at the manufacturers' plants and at the project site to ensure that it meets the required specifications. The quality of civil engineering work, such as trenching, ducting, and other operations, shall be inspected by the FAA and approved after each major construction step. The contractor shall inform the FAA of manufacturing/shipping schedules and shall offer representatives of the FAA the opportunity to witness acceptance tests. These tests shall be performed on a statistically meaningful number of samples, as specified by FAA engineers. After receipt of equipment shipment and prior to

installation, the contractor shall subject equipment to a thorough visual inspection. An FAA representative shall be notified in advance and afforded the opportunity to be present and witness this step. Nameplates and markers shall be checked against the required specifications, and deviations brought to the FAA's attention. At the FAA's request, quality control checks, including acceptable electrical measurements (such as cable insulation resistance tests and surge protection leakage current measurements) shall be performed and reported. After the installation of cable systems is completed, acceptance/commissioning tests shall be performed.

All equipment and materials shall be subject to acceptance through the manufacturers' certification of compliance with applicable requirements when so requested. The requirements of this standard shall be considered as minimum requirements and shall not relieve the contractor of the responsibility to furnish and install higher grades of materials than specified when so required by the contract drawings and specifications. The installation shall conform to the most stringent requirements of the National Electrical Code (NEC), the local electrical codes, NFPA-70E, and applicable ANSI and IEEE standards, e.g., the National Electrical Safety Code (NESC), as well as other relevant guides and standards as listed in Section 2.

3.3.3 Qualifications of personnel

3.3.3.1 Designers

The design team shall have at least one engineer with significant experience in medium voltage design, review, and construction management. The engineer shall have worked with electrical power systems, and shall have designed electrical distribution systems whose reliability, maintainability, availability, and fault tolerance are of a similarly high level to those found in campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities. The design engineer shall have the ultimate responsibility for the construction set (specifications, drawings, and cost estimates) and installation quality control. Drawings and engineering documents published by a non-FAA entity shall be signed by a registered professional engineer with knowledge and qualifications tailored to underground medium-voltage and low-voltage electrical distribution systems. Drawings and engineering documents published by a non-FAA entity shall be signed as approved by FAA Engineering Services or a representative of the PSG ELD/Power Cable Program upon design acceptance. Drawings ready for release for construction shall incorporate the project's design acceptance drawings by reference.

3.3.3.2 Installation Crew

Experienced personnel regularly engaged in underground electrical distribution system work shall perform the installation. Personnel exclusively or mainly trained in overhead line work, or low voltage facility wiring work, are not sufficiently qualified to install FAA medium-voltage underground electrical distribution systems. Workers shall be properly licensed where required by law. Only qualified personnel may work on electric circuit parts or equipment being installed.

A qualified person is one who has skills and knowledge related to the construction and operation of the FAA's electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. Management personnel shall be responsible for authorizing the qualified personnel to perform a task. Besides completion of Occupational and Safety and Health

Administration (OSHA)/FAA required electrical safety training for qualified personnel, those persons authorized to work on FAA ELD systems shall meet the requirements of a Qualified Person as mandated by OSHA and as discussed in NFPA 70E.

Along with training, personnel performing medium voltage work on FAA ELDs shall have: (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, including wire and cables, (2) the skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors or parts, (3) knowledge of the safe approach boundaries, work clearances, and voltages involved, (4) familiarity with construction and operation of equipment and the hazards involved, (5) familiarity with electrical safety related work practices and precautionary techniques, (6) familiarity with proper use of personal protective equipment (PPE), arc flash, insulating and shielding materials, (7) familiarity with the proper use of insulated tools and test equipment, (8) ability to make good decisions in determining the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely, (9) familiarity with safety precautions associated with confined spaces, (10) knowledge of skills and techniques regarding how to select and use a voltage detector and phase meter, (11) familiarity with mechanical aspects of ELD installation work such as trenching, boring, excavation around existing utilities and structures, manhole rigging, and pulling cable, and (12) CPR training and basic training for emergency dispatch if an electrocution or confined spaces injury occurs.

Cable termination and splicing shall be performed only by experienced and qualified medium/high voltage electricians experienced in underground distribution systems. Before cable splices/terminations are made, the FAA may request an example splice and/or termination be made to demonstrate the electricians' qualifications. In order to qualify the splicer, this example splice and/or termination shall comply with the requirements of accessory manufacturers, and pass the requirements of IEEE standards 48, 386, and 404 with respect to partial discharge.

3.3.3.3 Inspectors and Testing Personnel

Inspectors of the FAA ELD distribution systems shall have knowledge and experience in quality control activities related to the inspection of cables laid in trenches such as are found at large campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities; shall perform quality control activities during installation and preacceptance of medium and low-voltage switchgear and sectionalizers, protective devices, power distribution transformers, surge arrestor equipment, and motor control centers; shall review functional tests of electrical equipment and conduct inspection and preacceptance of electrical drawings, termination drawings, and cable schedules; and shall interpret the various drawings used in the projects for executing and recording the work.

Test personnel shall be qualified persons meeting the requirements stipulated in Appendix C.

3.3.4 Receiving, storing, and protecting

The contractor shall receive, store, protect, and handle products according to National Electrical Contractors Association NECA 1, *Standard Practices for Good Workmanship in Electrical*

Construction, and NECA/NEMA 605, *Recommended Practice for Installing Underground Nonmetallic Utility Duct.*

3.3.5 Sequencing and scheduling

The contractor shall:

1) Notify the FAA resident engineer to schedule inspection of each duct bank or duct bank segment before concrete is placed.

2) Provide the FAA resident engineer with reasonable notification before the anticipated date of acceptance testing of the newly installed replacement ELD system so that arrangements can be coordinated with the testing contractor.

3.3.6 Cable testing

3.3.6.1 Government-furnished cable

If government-furnished power cable is delivered to the contractor, the contractor shall test the cable on the reel and report electrical or physical cable defects within two weeks of cable receipt. If adequate cable lengths are unavailable for testing on the reel, a visual inspection shall be made and damage reported to the FAA. The required tests shall then be made immediately after unreeling. Defects discovered when installing the cable shall be reported to the FAA in accordance with the contract provisions.

3.3.6.2 Contractor-furnished cable

Single and multi-conductor power cables furnished by the contractor shall conform to the FAA specifications given in the Products section of this specification.

Cable shall meet the following minimum requirements:

a. Copper conductors.

b. Thermoplastic, thermosetting, or silicon rubber insulation.

c. Neoprene, polyethylene, or vinyl jacket for normal areas, and polytetrafluoroethylene (PTFE) (Teflon®) jacket in areas exposed to fuel, oil, solvent or chemical leakage, excessive groundwater, or extremely acidic soil.

d. For cables with rated voltages to 8 kV, cable insulation shall have a minimum continuous voltage withstanding capability of four times rated voltage (but not less than 150 volts). For rated voltages above 8 kV, insulation shall have a minimum continuous voltage withstanding capability of three times rated voltage. Cable voltage surge capabilities shall be 15 times rated voltage for voltages to 8 kV, nine times rated voltage for voltages above 8 kV through 15 kV, and seven times rated voltage for voltages above 15 kV through 25 kV. Whenever a cable is covered by applicable ICEA/NEMA specifications,

the cable shall pass the test requirements for such cable. In addition, the installed cable shall satisfy after-installation acceptance tests as specified below, and in Appendix C.

e. The pull strength of the completed cable(s) shall exceed the expected installation forces by a minimum of 50 percent.

3.3.6.3 Acceptance testing of new cable

Following installation, the contractor shall perform cable testing in the presence of the FAA. The contractor shall furnish necessary test instruments except where otherwise indicated in the project plans. Only currently calibrated instruments shall be used for cable testing. A laboratory approved by the measurement instrument manufacturer shall have performed instrument calibration. When conducting FAA-authorized third-party testing, offline partial discharge testing shall constitute the final acceptance test after completion of the installation.

Testing shall be completed on contractor-installed cable before connection is made to existing cables. If warranted, the FAA will test existing cables and provide the results to the contractor through the contracting officer prior to the contractor splicing or connecting cables he has installed to existing cables.

Certain acceptance tests classified as "destructive" by the IEEE shall only be conducted on newly installed cables. Such tests shall only be conducted within the test constraints given in Appendix C. Destructive tests shall not be performed on in-service (five years or older) power cables.

3.3.6.4 Acceptance testing of new power cables above 2000 volts

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

New FAA underground, shielded, medium-voltage power cables rated 2000 volts and above shall be subjected, after installation but before connection to terminal equipment, to the following acceptance tests:

a. Continuity test for cable conductor, shield, and armor, using an ohmmeter type instrument. See FAA Order 6950.22 for parameters and test equipment.

b. Limited-voltage DC insulation resistance test using a Megger ™ type instrument. This test is formulated to apply and hold a DC voltage on the cable for a specified time, while measuring insulation resistance. See Appendix C for test description and processes.

c. One of the following tests:

a. Very low frequency (VLF, 0.1 Hz) AC high-potential withstand "pass/fail" test. The purpose of this type of test is not to ensure cable system future performance but simply to

reassure the construction team that the line is not grounded/shorted before energization. The test shall be performed after cable system installation, including terminations and joints, but before the cable system is placed in normal service. See Appendix C for test description and procedures.

b. If third-party partial discharge acceptance testing is authorized, a diagnostic 50/60 Hz, off-line partial discharge test. This test can localize and determine the severity of any defects in the new installation. Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm shall be a qualified contractor preauthorized by the FAA. See Appendix C for test description and procedures.

3.3.6.5 Acceptance testing of new power cables 600 volts and below

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

All low-voltage (≤ 600 V) power cables shall measure not less than 50 megohms resistance between conductors, and between conductors and ground (see FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Measurements shall be taken at not less than 500 volts DC and not more than 1000 volts DC. This test does not constitute proof that the system is free from insulation defects but rather supplies evidence that the insulation was not damaged during the installation process.

3.3.6.6 Failure of cable under test

If the contractor-furnished cable fails to meet test requirements after installation, the contractor shall repair or replace, at his expense, the sections of cable proven defective.

If the government-furnished cable fails to meet test requirements after installation due to contractor's faulty installation practices, the contractor shall repair or replace the defective sections of cable at contractor's expense.

The installation contractor shall be responsible for retest costs if components are found to be substandard during acceptance test(s) as a result of contractor faulty installation practices.

4. PRODUCTS

4.1 Product options and substitutions

Alternative products may be substituted for product types that do not apply to the project. Consult with the airport authority and the local FAA project engineer.

4.2 Power cable

Single and multi-conductor power cables shall conform to the following FAA specifications:

a. FAA-E-2013 for single-and multi-conductor power cables used in exterior 600 volt applications.

b. FAA-E-2793 for single and multi-conductor power cables used in exterior 2,000 to 35,000 volt applications. Reference Section 4.2 for product factory certified test result reporting requirement.

4.3 Transformers

4.3.1 High voltage transformers (>600 volts)

4.3.1.1 Transformer design

ELD transformers are normally installed outdoors with proper clearance from structures. Transformers shall be "enviro-friendly" mineral-oil-filled or biodegradable electrical insulating and cooling-liquid filled. Choose less-flammable transformer liquids unless there is a specific requirement to do otherwise.

If the local site stipulates less flammable transformer liquids, the following section shall apply, use NFPA 70 for liquids having a fire point not less than 300 degrees C tested per ASTM D92 and a dielectric strength not less than 33 kV tested per ASTM D 877. Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate. The fluid shall be a biodegradable electrical insulating and cooling liquid classified by UL and approved by FM Approvals® as "less flammable" fluids. The fluid shall meet the following properties:

- Pour point: ASTM D 97, less than -15 degree C,
- Aquatic biodegradation: EPA 712-C-98-075, 100%,
- Trout toxicity: OECD Test 203, zero mortality of EPA 600/4-90/027F, pass.

Silicon-filled and R-temp filled transformers shall not be used for less-flammable applications.

Transformers shall be pad mounted and of dead front design. If two-compartment transformers are required, obtain preapproval from the lead Engineering Services engineer or the Power Services Group, AJW-22. Aluminum core construction is acceptable. Due to associated safety hazards, transformers of the pole-mounted style shall not be used for ground-level FAA ELD applications.

4.3.1.2 Transformer bases and cabinets

Use stainless steel bases and cabinets in most applications, unless otherwise specified. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.3.1.3 Warning signs and arc flash/shock hazard labels

For the enclosures of pad-mounted transformers having a nominal rating exceeding 600 volts, provide warning signs. After completion of arc flash hazard and shock analyses, label transformers with arc flash hazard and shock hazard warning information suitable to the particular installation.

4.3.1.4 Transformer losses

Transformers should meet the efficiency standards set forth in DOD's Unified Facility Guide Specification (UFGS) 26 12 19.20, *Single Phase Transformers,* Section 2.2.3.

4.3.2 Low-voltage transformers (<600 volts)

In FAA ELD systems, dry-type distribution transformers are used for buck boost applications or for short point-to-point distances for small loads of 600 volts or less. When used indoors, refer to FAA Specification FAA-C-1217, *Electrical Work, Interior.*

Transformers shall be mounted to allow for adequate ventilation (suitable for the local ambient temperatures).

4.4 Switchgear and sectionalizers

FAA ELD systems contain two types of switchgear: switch pads and sectionalizers. Both are fused devices used to de-energize equipment to allow work to be done and to clear faults downstream. More importantly, they isolate faulted line segments from a distribution system. These units shall be dead front-type units.

- Low-profile switch pads are typically used for single-phase applications.
- Sectionalizers are typically used for three-phase applications.

- Enclosures shall be outdoor rated or stainless steel, depending on location, meeting the requirements of ANSI C57.12.28. Use steel construction for typical installations. Use stainless steel construction for corrosive/salt environments.
- Pads or vaults shall be constructed of concrete or composite concrete-glass material. Concrete is preferred, but the latter may be used if approved by the FAA Resident Engineer and included on the drawings.
- Bases and cabinets shall be constructed of materials based on geographic location. Applications in dry locations shall employ steel; in wet locations, stainless steel.
    - Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.
    - In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.5 Service disconnecting means

A main disconnect switch (MDS) ensures that electrical service to a facility can be completely de-energized for service or maintenance.

- MDSs shall be outdoor rated or stainless steel. Enclosures shall be NEMA 3R for typical applications, NEMA 4X for corrosive/salt environments.
- Pads shall be constructed of concrete or polymer concrete composite material. Concrete pads shall be no less than 6 in. thick. Concrete pads shall be brushed, chamfered, and graded for drainage. Expansion couplers should be considered in areas prone to frost heaving or ground settling.

4.6 Terminations and splices

4.6.1 Terminations

All power cable terminations rated above 4000 volts or with an outer shield shall be made with an authorized stress-relief device. Cable terminations shall be of a prefabricated design. Special care shall be exercised to provide the proper ratings and physical dimensions.

4.6.2 Splices

For medium voltage power cables (600 volts and above), use cold-shrink splice kits meeting ANSI/IEEE Std. 404 (for a 15 kV rating). For power cables 600 volts and below, use heavy-wall

self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006. Alternatively, use a poured epoxy splice, or any other splicing means approved by ANSI standards.

4.7 Overcurrent protective devices

- For FAA ELD systems, the preferred protective devices are fuses. In transformers, fuses shall be immersion-type, current-limiting fuses, accessible from the exterior of the equipment.
- The specific type and size of protective device shall be selected based on a protective device coordination study and short circuit analysis, and as provided in the drawings.

4.8 Underground duct systems

The configuration of an underground duct system shall depend on the specific application. Conduit types used within FAA duct systems shall be of the size, material, and type indicated on the contract documents. Size of conduit shall always be indicated on the drawings. All conduit material shall be UL listed and installed in accordance with UL listings.

4.8.1 Concrete-encased rigid nonmetallic conduit

Rigid nonmetallic conduit consists of two types:

1) Concrete-encased Schedule 40 PVC conduit is preferred for ELD duct systems. To reduce costs or for special applications, direct-buried Schedule 80 PVC conduit may be used in lieu of concrete encasement.

2) High-density polyethylene (HDPE) is a rigid nonmetallic conduit commonly used for boring.

4.8.1.1 PVC conduit

PVC conduit shall meet the requirements of UL651 – *Schedule 40 and 80 Rigid PVC Conduit,* NEMA TC 2 – *Electrical Polyvinyl Chloride (PVC) Conduit.* Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.1.2 HDPE conduit

HDPE conduit shall meet the requirements of ASTM F2160-10/ASTM 1962-11/NEMA TC7.

4.8.2 Plastic-coated steel conduit

4.8.2.1 PVC coated RGS

Where situations warrant, such as when runway and equipment shutdown impacts are a consideration, PVC coated RGS may be used in lieu of concrete encased PVC duct. This substitution must be annotated on the drawings. Direct-buried rigid galvanized steel shall be

plastic coated. An acceptable alternative is RMC wrapped in half-lap fashion with pressure-sensitive 10-mil PVC-based corrosion protection tape.

PVC exterior coated, urethane interior coated, galvanized rigid steel conduit shall meet the requirements of NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.2.2 Fittings and conduit bodies
Use 40 mil PVC exterior coated, urethane interior coated, zinc-plated, threaded, malleable iron meeting the requirements of UL514B – *Fittings for Conduit and Outlet Boxes,* and NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.3 Direct buried rigid nonmetallic conduit

Direct-buried conduit shall be Schedule 80 PVC.

Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing.*

4.8.4 Rigid metal conduit (RMC)

Above-ground exterior conduit shall be rigid steel conduit.

Conduit used in exterior applications such as in an equipment rack shall meet the RGS requirements of UL6 – *Rigid Metal Electrical Conduit,* and ANSI C80.1 – *Rigid Steel Conduit, Zinc Coated.*

RMC fittings and conduit bodies shall meet the requirements of UL514B and ANSI/NEMA FB1.

Fittings: Follow NEMA TC 9, NEMA TC 14, and ASTM F-512.

4.9 Corrosion protection tape

Use pressure-sensitive, 10-mil-thick, PVC-based tape for corrosion protection of metal conduit and fittings.

4.10 Insulating bushings

Use NRTL-listed insulating bushings with 105° C rated insulation. Apply insulated protective caps to any unoccupied bushings. Dust caps shall not be used as substitutes for protective caps.

4.11 Grounding bushings

NRTL-listed, galvanized malleable iron, 150° C rated insulated throat grounding bushings with lay-in type ground cable lugs.

4.12 Sweeps

All sweeps shall be PVC-coated or tape-wrapped rigid galvanized steel (RGS).

Do not provide sweeps into a manhole. Vaults shall be considered for all transformer and switchgear applications wherever possible, eliminating the need for sweeps.

4.13 Duct spacers

Standard precast spacers ("chairs") shall be used for duct support and alignment. Duct spacers shall provide a 3-inch separation between the conduit and the ground. There shall be a minimum of 3 inches of concrete on bottom, sides, and top of duct.

4.14 Duct plugs

In unused ducts, use soft, expansible gasket material compressed with non-metallic plates and bolts to produce a positive seal against water and gas.

4.15 Duct sealant and joint filler

Use expandable foam duct sealant kits to prevent water and gas from entering manholes, vaults, or structures.

Use premolded joint filler to fill holes in and around conduit to keep rodents out of the ELD system. Use closed-cell expanded neoprene joint filler conforming to ASTM D1056 – *Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.*

4.16 Underground duct and cable warning tape

Furnish detectable underground warning tape for underground duct banks. Use aluminum-backed, 0.005 inch thick, underground warning tape with a red background color. Lettering shall be black and indicate the type service buried below:

"CAUTION BURIED ELECTRIC LINE BELOW"

Use tape width appropriate for the burial depth:

A. Three-inch wide tape for up to 18 inches depth.
B. Six-inch wide tape for up to 24 inches depth.

All direct buried cable shall be marked with extrusion-laminated underground marking tape. Tape shall be a minimum of six inches (6") wide and shall run continuously in the cable trench six inches (6") below the surface or as indicated on the project plans. Tape shall be bright red, and constructed of solid 100% pigmented plastic, and not an ink-coated plastic.

4.17 Pull wires and tape

For spare ducts, specify ¼ inch pull tape having a minimum tensile strength of 400 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc).

For ELD circuits that include raceways within vaults or other locations, raceway measuring/pulling tape may be used. Tape shall have permanently printed measurements in one-foot increments and minimum 1200 lb average breaking strength.

4.18 Precast electrical manholes and hand holes, accessories

4.18.1 Manholes and hand holes

Precast reinforced concrete electrical utility structures shall be of the size and shape as detailed on the drawings in conformance with ASTM C-858 – *Standard Specification for Underground Precast Concrete Utility Structures*. Electrical manholes are typically 4' long, 4' wide, and 4' high, or as shown on the drawings. Electrical manhole sections shall conform to ASTM C-478.

4.18.1.1 Manholes/hand hole structures, frames, and lids

4.18.1.1.1 Airports handling aircraft with maximum departure/takeoff weight of 30,000 lb and above--For airports with a design aircraft maximum departure weight of 30,000 lb and above,* manholes/hand holes, frames, and lids located within the airport runway/taxiway safety areas (RSA/TSA) shall be of the aircraft-rated type, designed and certified for 100,000 lb (45,000 kg) wheel loads with 250 psi (1.72 MPa) tire pressure. (Refer to FAA Advisory Circular 150/5320-6, Appendix 3, *Design of Structures for Heavy Airplanes*). Clearly indicate on the drawings underground utility structures that will be subject to aircraft loading. For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, those structures shall be aircraft rated.

Outside the RSA/TSA, H-20 highway-rated manhole and hand hole components are permitted, provided an adequate proof load safety margin for the casting is met. First, live loading shall meet basic H-20 loading requirements per A.A.S.H.T.O. HB-17, *Standard Specifications for Highway Bridges*. The live load shall be that loading which produces the maximum bending and shear moments in the structure. H-20 design wheel load is a minimum of 16,000 pounds, or 80 psi. For the safety margin, the casting must meet AASHTO M306, which requires that it pass a proof load test of 40,000 lb applied on a 9x9-in. pad in the center of the casting. H-20 rated utility structures that do not meet the above requirements shall not be used.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

*Airports handling dual-wheel-landing-gear aircraft up to 60,000 lb maximum departure weight are permitted to use highway-rated manholes/hand holes and components in the RSA/TSA because the wheel load is distributed over four tires (60,000 ÷ 4 = 15,000 lb). Adequate safety margins must be met through proof loading. Refer to the H-20 loading requirements specified above.

4.18.1.1.2 Airports handling aircraft maximum departure/takeoff weight of 30,000 lb or below-- For airports with a design aircraft maximum departure weight of 30,000 lb or below (60,000 lb if dual-wheel landing gear), manholes/hand holes, frames, and lids located both within and outside the airport runway/taxiway safety areas (RSA/TSA) shall be of the highway-rated type, provided a safety margin for the manhole casting is added. Live loading shall be for H-20 loading with adequate safety margin as described in Section 4.18.1.1.1 above. Clearly indicate on the drawings underground structures that will be subject to aircraft loading.

For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, and the expansion is expected to accommodate heavier aircraft with maximum departure/takeoff weight of 30,000 lb and above (60,000 lb if dual-wheel landing gear aircraft), those structures shall be aircraft rated. Concurrently, existing non-aircraft-rated manhole/hand hole structures throughout the airport's RSA/TSA areas shall be retrofitted with aircraft-rated structures and components.

Outside the RSA/TSA in non-vehicular traffic areas, other types of enclosure structures (e.g., polymer concrete, nonreinforced concrete, or other) may be used provided (1) they meet ANSI Tier 22 (design/ test = 22,500/33,750 lb) specifications, and (2) have been approved by the FAA resident engineer.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

Manhole markings--Identify electrical power manholes and hand holes by "FAA Power" markings cast in the steel cover, or so identified with a die stamped, nominal one sixteenth inch (1/16") minimum thickness copper plate, brazed or fastened to the cover with a minimum of two 10-32 brass machine screws.

4.18.2 Manholes accessories

Frame and lids--Use heavy duty cast iron manhole frame with solid lid. Lid may be spring loaded. Alternatively, lid may consist of partitioned aircraft-rated lid segments, each segment capable of being lifted separately, facilitating easier and safer access.

Racks--Cable racks and cable support arms shall be furnished in the quantities and locations indicated by the drawings for each manhole. Racks shall be made of nonmetallic material (for example, PVC, plastic, or UL-rated glass-reinforced nylon). Saddle arms shall be as per the approved project drawings. Splices and cables shall be attached to cable racks.

4.19 Grounding cables

Depending on the application, ELD exterior grounding conductors shall be of the type and size required by applicable sections of FAA-STD-019.

a. For equipment grounding conductors, use 4/0 AWG bare stranded, soft temper copper cable per ASTM B 8, *Standard Specification for Concentric-Lay Stranded Copper Conductors.*

b. For guard wire, use 1/0 AWG bare copper, stranded.

c. For bonding conductors, use No. 2 AWG bare copper, stranded.

4.20 Ground rods

Ground rods ("grounding electrodes") shall be three quarter inch (3/4") by ten foot (10') long copper or copper-clad steel.

4.21 Weather heads on risers, drip loops

Risers feeding FAA owned underground distribution systems shall have weather heads installed. Each weather head shall have drip loops that loop no less than 6" below the weather head.

4.22 Electrical equipment enclosures

Bases and cabinets of electrical equipment shall be constructed of materials suitable to their geographic location.

Typical, dry environments--For typical dry conditions, mild steel bases and enclosures may be used. These provide protection against rain, sleet, and snow in outdoor applications.

Corrosive or wet environments—For typical wet (or wet and salt-corrosive) conditions, use stainless steel bases and enclosures.

Use stainless steel bases and cabinets in most applications. The manufacturer's standard construction material is acceptable only in noncoastal and noncorrosive environments. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.23 Equipment vaults and pads

Follow the drawings for specification and construction details of equipment foundation support structures. Specific applications are as follows:

4.23.1 Concrete vaults

For low-profile single phase transformers, use precast concrete vaults to facilitate ease of transition from duct bank system to transformer termination points. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.2 Concrete pads for transformers

Foundations of poured concrete pads for larger size transformers (>50 kVA) shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

4.23.3 Concrete pads for equipment racks

Foundations of poured concrete pads shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall be chamfered, brushed, and graded for drainage. Expansion couplers on protruding conduits should be considered in areas prone to frost heaving or ground settling. Concrete shall meet or exceed a 28-day compressive strength of 3,000 psi.

Prefabricated concrete pads with cutouts for cables can be used where frost heave is prevalent. Arrange for lift equipment to place the pads. Install cables in conduit and leave a slack length of cable in case the pad is displaced upward by ground frost.

4.23.4 Composite polymer concrete equipment pads

If approved by the FAA Resident Engineer and included on the drawings, lightweight polymer concrete flat pads and box bases that provide sufficient strength-to-weight ratios may be used. These units have cutouts and preinstalled mounting hardware. No extra equipment is required to lift the pads into position.

Composite pads/boxes shall be composed of cement mortar reinforced by alkali resistant glass fibers. The material shall incorporate a minimum of 4 percent by volume of alkali resistant glass fibers.

Composite pads/boxes shall meet or exceed a compressive strength of 11,000 psi per ASTM C579-96, a flexural strength of 1,800 psi per ASTM C580-93, and a modus of elasticity of 2,900,000 psi per ASTM C580-93. Composite pads/boxes shall also pass chemical resistance and impact resistance tests in accordance with ASTM C267-97 and D2444-93.

Composite pads/boxes shall not warp, support flame, rust, or be UV degradable. They shall have a waffle bottom design to permit loose earth to fill bottom voids to level and stabilize the pad. The pad/box shall not be affected by asphalt, road salts, fertilizers, transformer oil, other common chemicals, weather, sunlight or other normal service conditions to which they may be exposed. Composite pads/boxes shall be capable, with equipment installed, of withstanding temperature variations of -40 degrees C (-40 degrees F) to +65 degrees C (149 degrees F) without cracking, splitting, or deforming. They shall not be designed and constructed so as to trap or hold water and shall be able to withstand repeated freeze-thaw cycles.

4.24 Bollards

Bollards shall be used only where it is necessary and/or as required by the airport authority to protect electrical equipment and enclosures from field vehicle damage or other mechanical damage. Bollard use and placement shall be as specified on the drawings or as determined by final location of equipment. Unless otherwise specified, use 4-in. diameter steel pipe filled with concrete. Bollards shall be placed 3 ft deep and extend 4 ft above ground level. Premanufactured plastic jackets shall cover each bollard.

5. EXECUTION

5.1 Scheduling of work

Airport runways must remain in operation during certain periods. Contractors shall proceed in a manner that produces minimum disruption to the FAA and airport operations. During construction activity, contractors shall coordinate work through the FAA Resident Engineer, the airport authority, air traffic control tower, airport security, and other contractors as defined by the contract documents. Work performed within the RSA/TSA of an active runway may require runway/taxiway closing. Advance notice of proposed work near an active runway shall be required to be given by contractors to the FAA.

5.2 Existing FAA buried cable and ducts

5.2.1 FAA documentation

The contract documents define the drawing format used by the FAA to record the location of buried cable and ducts. The contractor shall use the FAA format during the course of work to ensure the accurate location of the new installations as described on the FAA drawings. The contract documents shall include copies of FAA drawings for the area of work. Contract drawings and engineering documents published by a non-FAA entity shall be approved by the FAA project engineer.

5.2.2 FAA marking of known buried cables and ducts

All known FAA power and control cables leading to and from an operating facility will be marked in the area of work by the FAA for the information of the contractor before starting work. The FAA will mark these cables once for the contractor. It shall be the contractor's responsibility to maintain these markings throughout the course of the project. Airport mowers may be expected to be in use by airport personnel throughout the duration of the work, keeping markers visible. FAA is responsible for marking FAA cables ONLY. The contractor shall be responsible for marking other cables and utilities in the work areas through a third party location service.

5.2.3 Other buried cables, ducts, piping and items

Locating utilities--The contractor shall be responsible for contacting the utilities prior to starting work and for confirming the location of existing utilities and other items that may be buried in the area of work. Along an area suspected of having utilities of any sort, the contractor shall hand dig or use other authorized low-impact digging system. The airport authority shall be contacted to locate those items owned or known by the airport to exist.

Avoiding buried structures--The contractor shall take precautions to protect existing underground (buried) items including but not limited to; fuel tanks, water lines, cables, ducts, and structures.

Buried items shall be protected from damage for the duration of work. The contractor shall immediately repair, with equal material by skilled workmen, those items damaged by the contractor or subcontractor.

Procedure for making repairs during installation--Prior authorization from the FAA shall be obtained for the materials, workers, time of day or night for making repairs, method of repairs, and permanent repairs the contractor proposes to make. In the event of inadvertent damage, the contractor shall immediately stop work and notify the FAA and utility when appropriate. Repair work shall be inspected and authorized by the FAA with the concurrence of the affected utility company, airport, or other owner(s) of the damaged item(s).

Cables to be abandoned—When a DEB cable is identified to be abandoned, where possible it shall be disconnected and left in place. Unless otherwise directed, cut the cable, armor, and ground wires back 10 feet at each end. Where possible, exothermically weld the cable ends to ¾" by 10' ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

When a cable in duct is identified to be abandoned, ground the cable, armor, and ground wires at both ends. Where possible, exothermically weld the cable ends to ground rods 12 in. below grade. Document the section that was cut back as "abandoned" on as-built drawings.

Replaced cables—Replaced cables shall trace the same routing path as previously employed. Should there be a need to divert from the previous route, careful planning shall be exercised, especially in areas where utilities, communications, control, and NAVAIDS systems such as Glide Slope and Localizer facilities are installed or planned to be installed in the future. Approval from the office of primary interest is required.

5.3 Safety during construction and testing

All necessary site work included in the overall scope of work, from delivery to site to final authorization, shall undergo a safety risk assessment. A detailed, site-specific, Safety Risk Assessment shall be submitted by the contractor to FAA for final authorization no fewer than 3 weeks prior to commencement of on-site work. During construction, installation, and testing, the contractor shall comply with the safety rules of FAA (FAA Order JO 3900.XX, FAA Advisory Circular AC 150/5370-2) and those dictated by OSHA (Part 1926), NEC, ANSI/IEEE, and ANSI C2 (the NESC). The contractor shall be responsible for the implementation of FAA-authorized items in the Safety Risk Assessment document.

5.4 Excavation and trenching

The following are general excavation and trenching requirements. Note paragraphs that follow for particular requirements for either (1) direct earth buried cables, or (2) underground duct cables.

5.4.1 Depth requirements

IEEE ANSI C2 (part of the National Electric Safety Code) specifies the minimum legal depth requirements for medium-voltage power cable during installation. Tailoring organizations shall evaluate site-specific requirements and follow the following standards in order of precedence: (1) IEEE ANSI C2, then (2) paragraphs below, then (3) local standards if applicable.

Conduits shall meet the following minimum standards:

a. Unless otherwise specified due to soil conditions or other circumstances, cables, conduits, and ducts shall be buried to the minimum depth to their top as specified by the following paragraphs b through g. In the event that achieving the minimum depth is not feasible, follow the direction of the FAA Resident Engineer.

b. Top of direct-earth buried (DEB) conduit or cables under 600V shall be a minimum of twenty four inches (24") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

TABLE I. Burial depths (source: ANSI C2)

Voltage (phase to phase)	Depth of burial	
	(mm)	(in.)
0 to 600	600	24
601 to 50,000	750	30

c. Top of direct-earth-buried conduit or cables over 600V shall be a minimum of thirty inches (30") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

d. If finished grade has not been established before the cable trenches are excavated, it is the contractor's responsibility to determine what the final finished grade elevation will be and excavate the trench deep enough to meet the depth requirements at the end of the project.

e. Underground concrete-encased duct, and duct consisting of PVC Schedule 80, HDPE, or RGS conduit, shall be installed so that the top of the conduit is buried at not less than twenty-four inches (24") below finished grade.

f. Additional requirements for all ducts: concrete-encased duct, rigid steel conduit, or PVC conduit shall be installed so that the top of the conduit is buried as follows:

1. When installed under runways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

2. When installed under taxiways, not less than four feet (4') below the bottom of paving, or as specified by the airport authority,

3. When installed under other paved areas, in accordance with Table I or as required by the local jurisdiction.

4. For railroads and state-owned highways, at the minimum depth below grade as specified by those entities.

5. Where local conditions require unusually deep burial of ducts, contractor shall discuss the situation with the FAA project engineer and obtain preauthorization.

g. In northern climates where deep trenching is cost prohibitive, use a standard depth of not less than 24 inches (24") from top of duct, cable, or conduit to finished grade.

h. Cables shall not be direct buried under paved areas, runways, taxiways, roadways, railroad tracks, or ditches. Where cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in rigid steel conduit, concrete-encased PVC, steel conduit, or high-density polyethylene (HDPE) conduit, as defined by the contract documents. Where cables cross under railroad tracks, such cables shall be installed in accordance with the requirements of the railroad authority. Cables under railroad grades may be installed in reinforced concrete-encased ducts, rigid galvanized steel sleeves, or HDPE conduit, subject to the requirements of the railroad authority. HDPE must be of sufficient crush strength to withstand expected static and dynamic loads over the expected lifetime of the cable without deformation. For directional boring under railroad and roadway grades, standard dimension ratio (SDR) 11 or 9 shall be used depending on conditions and conduit diameter. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness. Damage to conduit coatings shall be prevented by providing ferrous pipe jackets or by predrilling. Ducts shall extend at least 1 foot beyond each edge of paving and at least 5 feet beyond each side of railroad tracks.

i. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering. Cables may be pulled into duct from a fixed reel where properly sized rollers are provided in the trench. Where cuts are made in paving, the paving and subbase shall be restored to their original condition. Where cable is placed in duct (for example, under paved areas, roads, or railroads), ducts shall be made to slope in order to drain.

5.4.2 Survey requirements

5.4.2.1 Recording of data

The ELD project record shall consist of (a) information entered in computer-aided design and drafting (CADD) systems, (b) manual plotting onto the FAA drawing set, (c) Global Positioning System (GPS) data, (d) Geographic Information System (GIS) information or databases, and/or (e) other appropriate documentation as set forth in the contract documents.

Placement of markers--Drawings shall record positions of markers placed in or on top of direct earth buried (DEB) power cable trenches, and at duct bank manholes and hand holes. The markers shall be identified on the drawings by a small circle with a "P" in the center for power cable, "C" for control/fiber cable, "R" for coaxial cable, "S" for special purpose points, and "T" for telecommunications.

DEB cable--DEB cable trenches shall be identified on the drawings with text boxes pointing to the trench indicating what is in the trench. If there are several cables in the trench, each cable shall be called out. Power cables shall be identified by the actual working voltage of the cable and not by the cable insulation rating. Anything unusual, peculiar, or unique about the cable runs shall also be called out in the drawings.

Duct banks--Duct banks shall be plotted on the drawings. Duct banks that are installed for future use shall have text boxes pointing to them indicating that they are future-use duct banks. In the case of a duct bank where the duct bank is not a straight line between the manholes or hand holes, enough markers of the type specified herein shall be installed to accurately depict the routing of the duct bank.

Manholes, hand holes, and splices--Manholes shall be identified on drawings by a small square with an "MH" in the center. Hand holes shall be identified by a small square with an "HH" in the center. Where manhole and hand hole numbers are provided on the contract drawings, they shall also be called out on the completed cable drawing. Splices made in manholes and hand holes shall be shown on the cable drawings.

Abandoned cables--The contractor shall provide data on the types and locations of abandoned cables in places where they affect the excavation of new trenching, such as at points of intersection with other structures, including runways, taxiways, concrete pads, utility pathways, roads, etc. This information shall be included on the drawings.

5.4.2.2 Survey points

The contractor shall record the survey point of each manhole using GPS coordinates. At each major change of direction of the cable circuit, a manhole shall be present and its location surveyed and recorded. Surveying and data gathering for this purpose shall be completed before a trench or structure is backfilled.

If for some reason the cable path deviates from a straight line between manholes and is not capable of being traced using tracing equipment, the deviation should be recorded as a survey point on the drawings for future reference. Where the cable terminates to a building, a transformer, an antenna, a light bar, an outside demarcation cabinet, switch rack, or other similar device, the survey shall include the four corners of the device or facility where it terminates. A tolerance of plus or minus five inches (± 5") will be acceptable for describing the cable path.

Special-purpose points--Special-purpose points may be used to indicate points such as splices or entrances to duct banks in records and on the drawings. Special-purpose points shall be accompanied by a text box to describe the function of the specific point.

5.5 Underground duct systems

Power distribution cables at FAA installations shall be installed in underground duct systems. Unless preauthorized per the drawing set and construction specifications, direct earth burial (DEB) of power distribution cables is prohibited. If preauthorized, any DEB construction shall meet the requirements in Section 5.6.

5.5.1 Preparation and excavation for underground ducts

In preparing to install underground ELD ducts, contractor shall meet the industry standards given in this section. Contractor shall also work with FAA to contact the owner for their requirements, coordinating underground ELD duct work to avoid interference with other airport projects and existing utilities. The contract specifier shall work with the Power Cable (ELD) Program Office to ensure coordination of work with other FAA programs that may have an interest in using the same duct system or trench.

The contractor shall excavate trenches for underground ducts as follows:

a. To the depth specified in paragraph 5.4.1c.

b. Install underground duct bank systems according to the NEC, the NESC, NECA/NEMA 605 (*Recommended Practice for installing Underground Nonmetallic Utility Duct)*, ANSI/IEEE C2, and other requirements in this section.

c. Verify routing and termination locations of duct banks before excavation for rough-in.

d. Verify that field measurements are as shown on the drawings.

e. Position trench so concrete envelope of duct banks shall have the following minimum horizontal and vertical separations from parallel or perpendicular runs of other utility pipes or conduits (Table II). Note: Measurements are guides only; check with local authorities and the owner for their specific requirements.

f. Make trenches of sufficient width to receive work to be installed and provide specified concrete coverage on sides.

g. Conduit or castings required under roadways or railroads shall be installed by boring. Jacking of conduit is not allowed. Conduits bored under roads off airport property shall be a minimum of thirty inches (30") below finished grade, or as required by the local jurisdiction.

h. Backfill excavations for duct banks and manholes in 6-inch layers using excavated soil. Remove roots, rocks and sharp objects. Furnish coarse sand as required for additional backfill material.

i. Moisture condition backfill soil and compact to 95% of maximum density under paved areas and 90% of maximum density under unpaved areas.

j. Overfill excavations to allow for settling.

k. Firmly tamp backfill in the separation area.

l. Restore area.

TABLE II. Spacing of power cable ducts from other utilities.

UTILITY TYPE	PARALLEL LINES	PERPENDICULAR CROSSINGS
Water	36 inches horizontal separation	24 inches
Gravity Sewer	36 inches horizontal separation	24 inches
Force Main Sewer	36 inches horizontal separation	24 inches
Storm Drain	36 inches horizontal separation	24 inches
Natural Gas	60 inches horizontal separation	24 inches
Steam or Hot Water	60 inches horizontal separation	24 inches
Open Communications	24 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete
Secure Communications	36 inches horizontal separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.	24 inches vertical separation of tamped soil or 6 inches of concrete; verify case-by-case with FAA office of primary responsibility.
Electrical	12 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete

5.5.1.1 Connecting requirements for HDPE conduit running through and emerging from a bore

When placing HDPE conduit underground through a bore, use one continuous length of flexible HDPE conduit. In instances where a continuous run of conduit is not possible, individual sections shall be joined using heat-welded (fused) connections. After emerging from a bore, the HDPE will typically terminate in a manhole at both ends.

To join lengths of conduit together after emergence from a bore, follow these procedures:

a. If the emerging HDPE conduit is to be joined to PVC conduit, the HDPE conduit section shall be run into the bell end of the PVC conduit and cemented using a special bonding agent (Table III) (see Appendix F for a sample two-part bonding product). Adhesives typically used for connecting PVC segments are not of sufficient strength for HDPE-to-PVC transitions and shall not be used. Alternatively, the HDPE conduit may be connected to a PVC coupling on the end of a length of PVC conduit. The point of

transition shall then either be (1) encased in concrete together with the remaining run of PVC, or (2) direct earth buried, depending on the type of burial method used for the rest of the run.

b. Connection details involving HDPE conduit shall be shown on the drawings.

TABLE III. Adhesive minimum pullout-force requirements for bonding HDPE to HDPE and HDPE to PVC conduit materials.

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ⅛ inch	760 lb
1 ½ inch	2 ⅜ inch	1,140 lb
2 inch	2 ½ inch	1,520 lb
4 inch	3 ¾ inch	4,560 lb

5.5.2 Backfilling

Backfilling material and procedures depend on the design used, whether concrete-encased duct or direct buried conduit. Consult FAA Advisory Circular AC 150/5370-10 for construction details.

Trenches shall be completely backfilled and tamped level with the adjacent surface. When necessary to obtain the desired compaction, backfill material shall be moistened or aerated. When sod is to be placed over a trench, backfill shall be stopped at a depth equal to the thickness of the sod to be used. Excess excavated material shall be removed in accordance with the contract documents.

5.5.3 Restoration

Restoration shall be in accordance with local airport authority requirements, or as otherwise stated in the contract statement of work. Where it has been removed, soil shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable laying, pad construction, and other work shall be restored to the original condition.

Restoration shall include the necessary grading, seeding, sodding, sprigging, or hydroseeding as required to restore the disturbed area to match the adjacent area. Where trenching cuts through paved areas, the surface shall be properly backfilled and resurfaced with paving similar to the original paving or concrete as the drawings specify.

Resurfaced areas shall be level with original paving, free from cracks, and capable of withstanding full traffic loads without settling or cracking. The contractor shall be held responsible for maintaining all disturbed and restored surfaces until final acceptance by the FAA.

5.5.4 Duct installation

Cable duct banks shall be installed outside of the airport runway/taxiway service areas (RSA/TSA), as well as ILS critical areas, to the greatest extent possible. Where trenching is required through an RSA or TSA area, place the manholes to the farthest extent possible outside the RSA and TSA while still maintaining standard spacing and directional change requirements as noted elsewhere in this specification. For locations of RSA/TSA/ILS areas, consult with the FAA Resident Engineer. (See also FAA Order JO 6750.16, *Siting Criteria for Instrument Landing Systems*, and FAA Advisory Circular 150/5300-13, *Airport Design*, particularly Chapter 6, *Navigation Aids [NAVAIDs] and On-Airport Air Traffic Control Facilities [ATC-F]*).

When there is an immediate change in direction of a duct system, a manhole or hand hole shall be installed. Any gradual change in direction (e.g., a gradual arc of the duct) shall require the approval of the resident engineer prior to installation.

5.5.5 Manhole and hand hole installation

5.5.5.1 Manhole installation

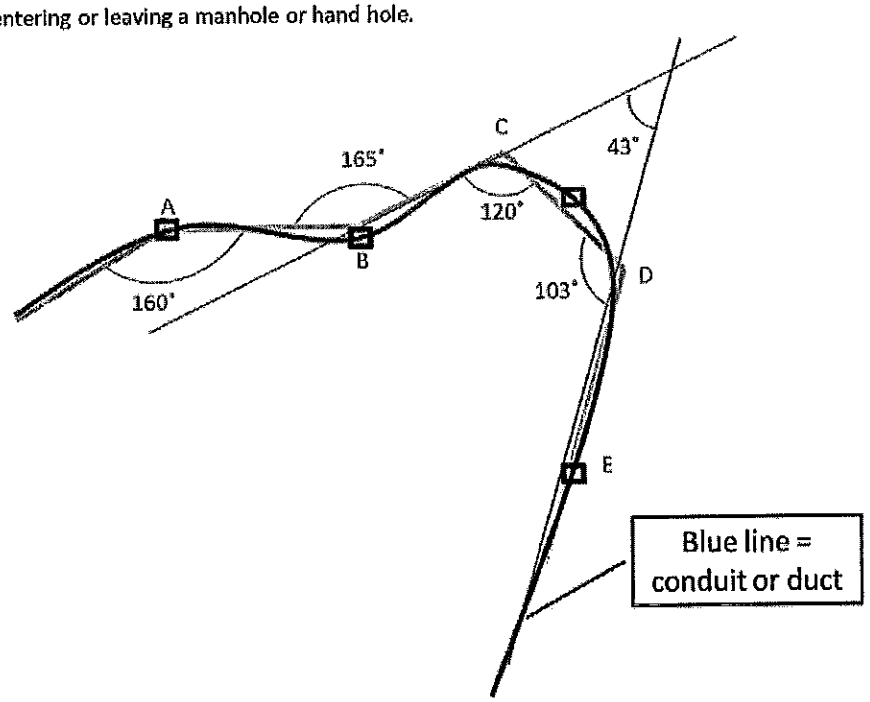
Install manholes every 600 feet. Where there are long continuous, straight runs, manholes may be placed up to 1200 feet apart with preapproval of the project engineer. When there is a planned change in direction of the conduit between manholes of greater than 45 degrees (cumulatively within a run), an additional manhole shall be installed in place of the directional change (Figure 5.5.5.1-1).

The top of the completed manhole shall be set above finish grade in unpaved areas to prevent water from ponding on the manhole. Place the top of the manhole 2 inches (2") above grade, plus or minus 1 inch (1"). Grade the backfill material downward and away from the manhole. A one-eighth-inch (1/8") per foot fall from the manhole top to finish grade, ten feet (10') from each edge of the manhole is recommended.

The manhole lower half shall be set on a four-inch (4") bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue or concern.

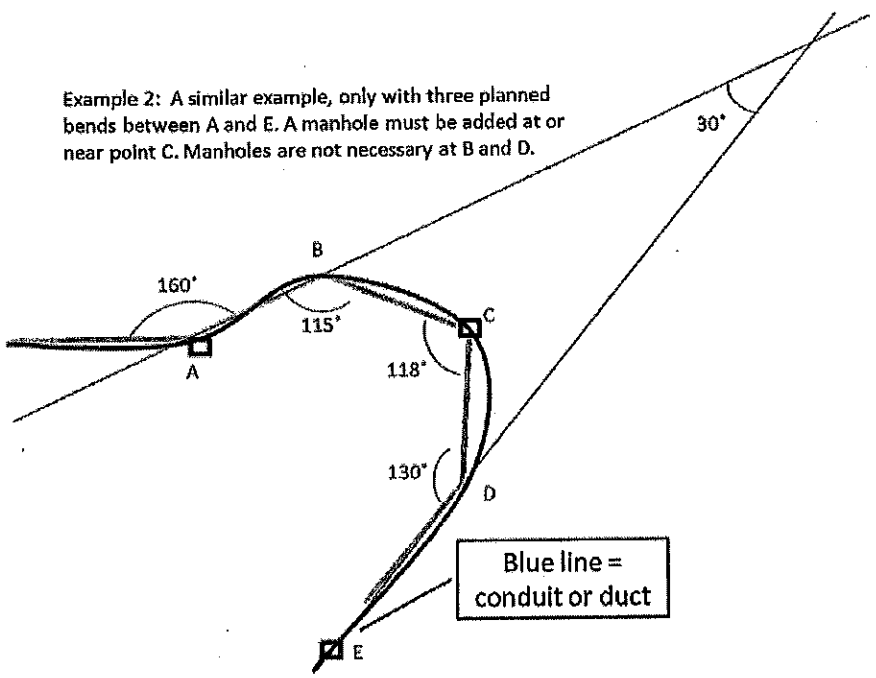
Backfill around the manhole in lifts commensurate with the soil and compact each backfill lift to the density of the surrounding earth.

Example 1: Bends at points A and B are greater than 45 degrees and are proper. Bends at planned manholes C and D each individually are greater than 45 degrees and are nominally proper, but in combination, they form a virtual angle of less than 45 degrees. Therefore, a manhole is required between points C or D. Measured angles shall take into account entrance and exit angles of the duct if entering or leaving a manhole or hand hole.



(A)

Example 2: A similar example, only with three planned bends between A and E. A manhole must be added at or near point C. Manholes are not necessary at B and D.



(B)

FIGURE 5.5.5.1-1. Adding a manhole at points of tight radius of a duct or conduit.

5.5.5.2 Hand hole installation
The top of the hand hole shall be set above finish grade in unpaved areas to prevent water from ponding on the hand hole. A one eighth inch (1/8") per foot fall from the manhole top to finish grade, ten feet (10') from each edge of the hand hole is recommended.

The hand hole shall be set on a four-inch (4") bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue/concern.

Backfill around the hand hole in lifts commensurate with the soil and compact each backfill lift to the density of the surrounding earth.

5.5.5.3 Manhole and hand hole penetrations
Where a steel conduit penetrates a wall of a manhole or hand hole, a grounding bushing shall be installed. These grounding bushings shall be connected to each other and to the earth ground system with 6 AWG tinned bare copper conductors.

Conduits entering a junction box or other electrical cabinets from underground shall be sealed with duct sealing compound. Expanding foam sealants are not allowed for this purpose.

Conduit connections to exterior boxes, electrical cabinets, or switches shall be made with weatherproof hub fittings.

5.5.6 Mandrel requirements

The contractor shall mandrel each duct or conduit installed and each existing duct or conduit in which cable is installed or replaced. As each conduit run is completed, proceed according to the following steps:

a. For conduit sizes 3 inches (3") and larger, draw a flexible testing mandrel approximately 12 inches (12") long with a diameter less than the inside diameter of the conduit through the conduit. Next, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs.

b. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs (see UFGS 33 71 02.00 20).

c. If the mandrel fails to pass through the duct being tested, either the duct is obstructed, misaligned, or the curve has too small a radius. If obstructed, use a high-pressure water jet to clear the conduit. Defective duct(s) shall be exposed and the defect corrected. After the duct(s) are repaired, repeat the mandrel test in that section of duct.

5.5.7 Spare ducts, preparation

Prepare spare ducts in the following manner. Install ¼ inch pull tape having a minimum tensile strength of 400 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc) unless cost prohibitive. Seal the open ends of spare ducts with removable tapered plugs of a type recommended by the duct manufacturers. Adapt the plug to firmly secure the pull tape.

5.5.8 Duct protection

All power cable ducts shall be securely fastened in place during construction and progress of the work, and shall be plugged daily at the end of work to prevent entrance of foreign material. A duct section having a defective joint shall not be installed.

All concrete-encased power cable ducts shall be raised at least 3 inches off the bottom of the trench using spacers ("chairs"). Bottom spacers may be secured to nominal one inch (1") boards to prevent sinking and overturning. This step shall be followed by a monolithic pour of concrete. Where two or more ducts are encased in concrete the contractor shall space them at not less than one and a half inches (1-1/2") (measured from outside wall to outside wall) using spacers applicable to the type of duct. As the concrete pour progresses, concrete not less than three inches (3") thick shall be placed around the sides and top of the duct bank. End bells or couplings shall be installed flush with the concrete encasement where required. Interlock spacers shall be used every five feet (5') to ensure a uniform spacing between ducts.

Joints in adjacent ducts shall be staggered a minimum of twenty four inches (24") apart and shall be made completely waterproof prior to covering with concrete.

5.5.8.1 Concrete mix specification

Concrete used in FAA ELD projects shall meet the cement, fine and coarse aggregate, and water specifications; mix design; compressive strength; and curing and protection requirements of FAA Advisory Circular AC-150/5370-10. Concrete for ELD structures such as pads and vaults shall have a minimum 28-day compressive strength of 3,000 psi when tested per ASTM C39. Concrete for concrete-encased ducts shall also meet the minimum strength requirement of 3,000 psi, unless otherwise directed by the FAA Resident Engineer.

5.5.9 Ducts without concrete encasement

Trenches for single-duct power cable runs shall be no less than six inches (6") or more than twelve inches (12") wide, and the trench for two or more ducts installed at the same level shall be proportionally wider. Trench bottoms for ducts without concrete encasement shall be made to conform accurately to grade to provide uniform support for the duct along its entire length. A three inch (3") layer of bedding material shall be placed around the ducts. The bedding material shall contain no particles that would be retained on a half inch (1/2") sieve. The bedding

material shall be tamped until firm. When two or more ducts are installed in the same trench without concrete encasement, they shall be spaced not less than two inches (2") apart (outside wall to outside wall) in a horizontal direction, or not less than six inches (6") apart (outside wall to outside wall) in a vertical direction.

5.5.10 Separation of cables

For non-distribution power cable installations in the vicinity of power cables, consult first with the FAA office of primary responsibility for guidance.

Subject to the approval of the FAA project engineer, separation of cables installed in conduit or duct shall be as follows:

a. Power cables of the same circuit shall be installed in the same conduit.
b. Conductors of circuits rated 600 volts, nominal, or less, ac circuits, and dc circuits shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway. Conductors shall have an insulation rating equal to at least the maximum circuit voltage applied to a conductor within the enclosure, cable, or raceway. (NEC 300.3 C 1)
c. Conductors of circuits rated over 600 volts, nominal, shall not occupy the same equipment, wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts, nominal, or less unless preauthorized by the FAA project engineer and permitted in NEC 300.3 (C)(2)(a-e).
d. Except in circumstances authorized by the FAA project engineer, power cables shall not be installed in the same duct systems with communication, control, and signal cables.
e. If joint-use applications apply and are authorized, power cable shall be installed in its own separate conduit. This conduit shall be separated a minimum of three inches (3") outside wall to outside wall, from conduits that contain communications, control, and signal cables. The actual separation for each specific case shall be stipulated by the FAA project engineer.
f. Fiber optic, communications, and control cables shall have completely separate and clearly identified and marked hand holes, pull boxes, and junction boxes.

5.5.11 Installation of cables

To minimize splicing, the longest practicable lengths of cable shall be pulled into the ducts at one time. Unless otherwise specified, electrical power manholes and hand holes shall be as far apart as practicable based on the pulling specification of the cable installed. Typically, manholes and hand holes are installed 600 ft apart and at all points where directional change of the duct system is greater than 45 degrees. For long, straight, continuous runs, spacing may be increased, not to exceed 1,200 ft, provided cable manufacturer's specifications for pulling tension has been met, and subject to the project engineer's oversight. To meet grounding requirements of underground multigrounded neutral cable systems over 1000 V, under no condition shall the distance between manholes or hand holes exceed 1,200 ft in accordance with NFPA 70 (NEC) Rule 96C, and ANSI C2 (NESC) standards.

Splicing lengths of cables of different construction types together is not allowed. For example, do not connect shielded cable to concentric cable, or shielded cable to old unshielded cable. Exceptions to this rule will require written PSG approval before installation.

Where a power cable duct or conduit crosses a runway or taxiway, manholes and hand holes shall be placed just outside the RSA/TSA boundaries on opposite sides of the crossing. This will allow for adequate working space to avoid penetrating the safety areas during installation and maintenance activities.

The contractor shall verify that the duct is open, continuous, and clear of debris or blockage (use mandrel) before installing cable. Cable shall be installed in a manner to prevent harmful stretching of the conductor or damage to the outer protective covering or conductor insulation. Until connections are made, cable ends shall be sealed using adhesive-lined, heat-shrink end caps. Where more than one cable is to be installed in one duct, cable shall be pulled at the same time. In no case shall a splice be pulled into a duct or conduit.

When cable cutting is required, cable ends shall be effectively sealed against moisture immediately after cutting, using end caps as above. Bends of a radius less than eight (8) times the diameter for rubber-covered or plastic-covered cable, or twelve (12) times the diameter for metallic armored cable, shall not be made. Cable that has been kinked shall not be installed.

When unreeling, an observer shall be stationed at the reel to report cable irregularities. Unless specifically stated in the drawings, cables for installation in ducts or for direct burial shall comply with FAA-E-2013D and FAA-E-2793A. Specifically excluded are bare concentric neutral wire cable types. Grounding conductors, where required, shall be a minimum size of 6 AWG bare copper wire. Fire wrap medium voltage cables in all manholes and hand holes.

5.5.12 Cable pulling

The below provisions on cable pulling shall be followed unless otherwise specified on the submittals matrix (Appendix E).

The contractor shall obtain from the manufacturer an installation manual or set of instructions that address such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure.

The contractor shall then perform pulling calculations and prepare a pulling plan, which shall be submitted along with the manufacturer's instructions. Cable shall be installed strictly in accordance with the cable manufacturer's recommendations, ANSI/IEEE C2 standards, and the authorized installation plan.

The pulling plan shall include:

a. Site layout drawing(s) with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.

b. List of cable installation equipment.

c. Lubricant manufacturer's application instructions. Corrosive lubricant is prohibited.

d. Procedure for resealing cable ends to prevent moisture from entering cable.

e. Cable pulling tension calculations of all cable pulls (calculated values, not maximum values).

f. Cable percentage conduit fill.

g. Cable sidewall bearing pressure.

h. Cable minimum bend radius and minimum diameter of pulling wheels used.

i. Cable jam ratio. Refer to Appendix B, item 4).

j. Maximum allowable pulling tension on each different type and size of conductor.

k. Maximum allowable pulling tension on pulling device (see UFGS-33 71 02.00 20).

Prior to pulling cable, pump the water out of the manholes and pull a mandrel/swab 1/4 inch smaller than the duct diameter through duct run to ensure adequate opening of duct run. Thoroughly swab conduits to remove foreign material before pulling cables.

Cables shall not be pulled from an outdoor (exterior) location when the outdoor (exterior) air temperature is below the cable manufacturer's minimum recommended pulling temperature.

Contractor shall furnish required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but be not limited to, framework, sheaves, winches, cable reels and/or cable reel jacks, duct entrance funnels, pulling tension gauge, and similar devices.

The diameter of the sheaves shall be at least 10 times that of the diameter of the largest cable. Equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used. Cable installation may be accomplished using a power winch or by hand.

Cable pulling lubricant shall be used to ease pulling tensions. The lubricant shall be compatible with the jacket material. The FAA project engineer will authorize the pulling compound. Lubricant shall be water or silicone based so as not to injure the cable material used. Wax-based

lubricants are not allowed. Lubricant shall not harden or become adhesive with age. Petroleum grease shall not be used.

Cable ends shall be sealed and firmly held in the pulling device during the pulling operation.

Use of a tensiometer is required for cable-pulling operations. Actual pulling tensions shall be continuously monitored and compared to both (1) calculated pulling tensions as in item "e" above, and (2) maximum allowable pulling tensions as in item "j" above. If actual pulling tension exceeds calculated pulling tension by 30% or more, the pulling operation shall be suspended and the project engineer consulted for investigation of a possible pulling obstruction or other anomaly. The cable pulling operation shall not exceed maximum allowable pulling tension. See Figure 5.5.12-1.

During pulling operations, several personnel shall be stationed at key points to ensure safety to cable and personnel: at duct entry, duct exit, cable feed, and at the pulling machinery.

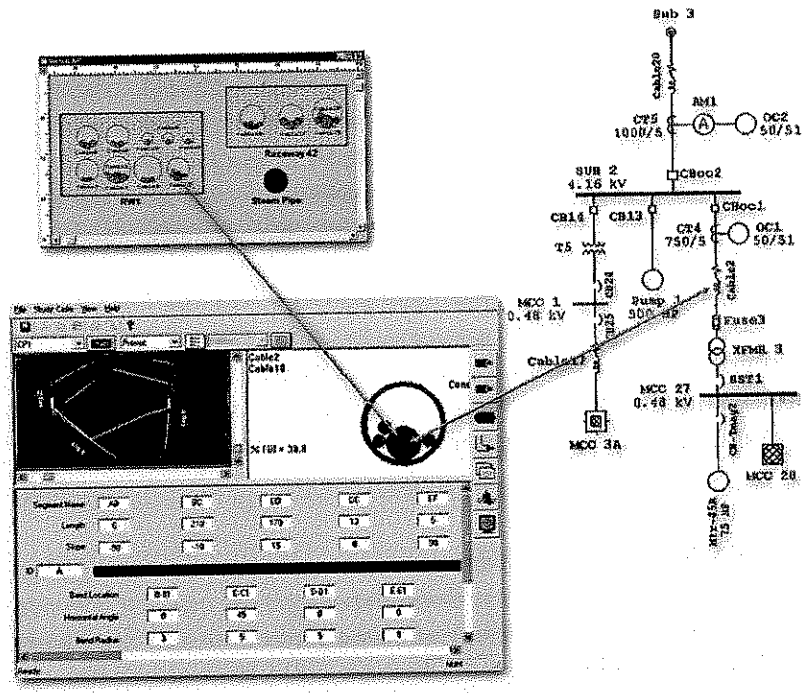


Diagram courtesy of ETAP Cable Systems Software

FIGURE 5.5.12-1. Industry software is readily available to assist with pulling calculations.

Avoid abrasion and other damage to cables during installation. The surface of a cable sheath or jacket shall not be damaged to a depth greater than one tenth ($1/10^{th}$) the original thickness or be flattened out-of- round more than one tenth ($1/10^{th}$) of the outside diameter.

Where cables are left in manhole or switchgear overnight or more than 8 hours prior to termination, the cable ends shall be sealed with paraffin or shrink wrap caps and supported in a

manner which will prevent entrance of moisture into the cable. Cable shall be terminated and energized as soon as possible.

Table IV lists example maximum pulling tensions for commonly installed cables (see also Appendix B for a pocket guide on calculation method).

The table is for illustration purposes only; it is the designer's and/or installer's responsibility to obtain the manufacturer's data for the cable chosen for installation. The manufacturer's data shall be used in conjunction with the pull-configuration(s) proposed, cable type and ampacity, size of conduit, distance, grade, degree of sweeps/bends, proper lubricant, etc, to calculate the maximum tension for each cable pull. The resulting value shall not exceed cable maximum tension and maximum sidewall pressure values.

5.6 Medium-voltage direct earth buried cables

Direct earth buried (DEB) cables are to be avoided. However, if preauthorized per the FAA-approved drawing set and construction specifications, DEB cable construction shall meet the following requirements. Coordinate underground power cable installation work to avoid interference with other airport projects and with existing utilities.

General--The contractor shall excavate trenches for direct-earth burial cable as follows:

a. To the depth specified in paragraph 5.4.1b.

b. To a width of not less than four inches (4") for single or six to eight inches (6-8") for multiple runs of power cable.

c. To a width and depth that will provide horizontal or vertical separation of power cables from other power cables of different voltage ratings, or from power cable and a control or signal cable.

d. Where soil is known to be rocky, select backfill for cable protection. Backfill shall be firmly tamped in the separation area.

e. Restoration shall be in accordance with paragraph 5.5.3.

Unless otherwise specified, power cables in the same location and routed in the same general direction shall be installed in the same trench. Trenches for cables may be excavated manually or with powered trenching equipment. Cable plows shall not be used unless express permission is granted by the FAA project engineer. When rock is encountered, remove to a depth of at least 3 inches (3") below the cable and fill the space with sand or clean earth free from particles larger than 1/4 inch. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where materials in bottoms of trenches are other than sand, a 3-inch layer of sand shall be laid first and

TABLE IV. Maximum allowable non-armored cable pull tensions using dynamometer or rope.

CABLE	TENSION (Pounds)	ROPE DIAMETER (INCHES) Cotton	Manila	Dacron	Nylon
2 - 1c #8 Solid	264	3/16			
3 - 1c #8 Solid	264	1/4	3/16		
4 - 1c #8 Solid	422		1/4		
2 - 1c #6 Stranded	420	1/4	3/16		
3 - 1c #6 Stranded	420	5/16	1/4		
4 - 1c #6 Stranded	672	3/8		3/16	
1 - 2c #8 Stranded	264	1/4			
1 - 3c #8 Stranded	396	1/4			
1 - 4c #8 Stranded	528		1/4		
1 - 2c #6 Stranded	420	1/4	3/16		
1 - 3c #6 Stranded	630	5/16			
1 - 4c #6 Stranded	840	3/8	5/16	3/16	
1 – 1c #4 Stranded, Conc Neut (CN)	334	For pull rope sizes, consult manufacturer (etc)			
2 – 1c #4 Stranded, CN	668				
3 – 1c #4 Stranded, CN	1,002				
4 – 1c #4 Stranded, CN	1,069				
3 – 1c #2 Stranded	1,593				
4 – 1c #2 Stranded	1,699				
3 – 1c #2 Stranded, CN	1,856				
4 – 1c #2 Stranded, CN	1,962				
3 – 1c #1/0 Stranded	2,534				
4 – 1c #1/0 Stranded	2,703				
3 – 1c #1/0 Stranded, 600 V	2,955				
4 – 1c #1/0 Stranded, 600 V	3,124				

Legend: No. of cables - No. of conductors (c)/ Gauge (AWG)
Note: The above figures are to be used as a guide only. Consult with the manufacturer for exact maximum pull tensions for a given cable type. Ensure conformance with the ANSI/IEEE C2 standards.

compacted to approximate densities of surrounding firm soil. Trenches shall be in straight lines between cable markers. Bends in trenches shall have a radius of not less than 36 inches (36") consistent with the cable manufacturer's published minimum cable bending radius for the cable installed. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed.

Trenches shall be opened only for the time required to install, inspect and survey the cables in accordance with FAA Advisory Circular 150/5370. The trench shall be closed in the same working day or marked, barricaded and/or lighted according to current airport specifications and requirements.

Installation in trench--Direct earth burial cable shall be unreeled in place along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position shall not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Dragging cables over the ground shall not be permitted.

Separation of cables--Separation between direct earth burial cables shall be as follows:

a. Power cables may be laid together in the trench. In these instances, there shall be a minimum of 3 inches (3") of separation between cables.

b. Non-power cables (fiber optic, communications, and control cables) shall be installed in a separate trench from power cables (exception: DEB power cable crossing a control cable at the perpendicular and with 12 inches [12"] vertical separation). A concrete marker indicating the presence of power cables shall be installed along the route of the trench.

c. Where cables of different types (power and control or signal) or of different voltages are installed together as stated in (a) and (b) above, the individual cables or groups of the same type cables shall be clearly and unambiguously identified by installing metal or approved plastic tags indicating the type (power, control or signal) and voltages for power cables. These tags should be installed in accordance with Section 5.11.

d. Backfill that serves to separate cables shall be firmly tamped.

Bends--Bends in cables shall have an inner radius not less than those specified in NFPA 70 for the type of cable, or manufacturer's recommendation.

Splicing--Where splices are required, provide splices designed and rated for direct burial. See splicing Section 5.9 for instructions. All splices shall have their neutrals/shield solidly grounded.

Slack loop--A slack loop shall be provided at each end termination point of a cable to facilitate any future repairs. Slack loops shall have no bends with an inner radius less than twelve times the outside diameter of the cable. Where cable is brought above ground, additional slack shall be as shown by the drawings or as directed by the FAA.

Backfilling--After underground medium-voltage DEB cable has been installed and inspected, the trench shall be backfilled. The first layer of backfill shall be 3 inches (3") deep, loose measurement, and shall be either earth or natural sand containing no material aggregate particles that would be retained on a one quarter inch (1/4") sieve. This layer shall not be compacted. The second layer shall be 9 inches (9") deep, loose measurement, and shall contain no particles that would remain on a one inch (1") sieve.

The remainder of the backfill shall be excavated or imported material (if necessary) and shall not contain stone aggregate larger than 4 inches (4") maximum diameter. The second and subsequent layers shall be thoroughly tamped and compacted to the density of the adjacent undisturbed soil.

Thermal resistivity--Trench backfill shall have a soil thermal rho of 90°C-cm/W or less.

Screening/sieving-- Compacted trench backfills shall meet ASTM D422 and ASTM D698, shall be sufficiently compacted, and shall not have backfill lifts that are too thick. Failure to prepare backfill properly will result in degraded thermal capability of the cable system.

5.7 Cable installation in manholes

Cables shall be carefully formed on nonmetallic racks around the interior of manholes or hand holes, avoiding sharp bends or kinks. Ensure that enough cable is coiled in the manhole so that a number of splice repairs can be made without having to fully enter the manhole. Tie splices and cables to cable racks using one eighth inch (1/8") nylon line. Splices shall be a minimum of two feet (2') from the mouth of the duct opening into the manhole or hand hole. Where this is not possible, splices shall be located as advised in the manhole/hand hole specification or drawing. Splices in different cables shall be staggered.

5.8 Cable terminations, connections, surge protection, and fault protection

5.8.1 Cable terminations and connections

Installation of prefabricated cable terminations shall strictly conform to manufacturer's installation recommendations using proper specialized tools. A cable manufacturer's representative shall be present at least in the initial phase to provide guidance to the installation team. Special care shall be exercised to use the proper ratings and physical dimensions.

5.8.2 Connections to a three-phase engine generator

When providing backup power to other facilities, connect the two new single-phase legs to the lowest loaded phases of the generator. The lowest loaded phases shall be determined by performing a load reading. This reading shall be confirmed by referring to the history of the technical performance record (TPR).

5.8.3 Surge protection

Apply surge protection in accordance with the following standards:

a. For FAA-owned low voltage power systems (600 V or less) at or after the facility service entrance, surge protection devices (SPD) shall be applied in accordance with FAA-STD-019.

b. In ELD installations, a fused disconnect switch may be installed before the TVSS and connected to the line side of the service. The TVSS must be a UL 1449 (third edition) Type 1 device, which allows for protected line-side connection.

c. Surge protection for the 1000 V to 15 kV medium voltage range shall be implemented in accordance with ANSI/IEEE C62.11 and NEC Article 280.

d. Limit nominal voltage of ELD systems to 34.5 kV. For any other voltages, consult with the office of primary responsibility.

The following guidelines apply to locating and installing surge protection devices (SPD) (see Appendix A for product operating parameters).

a. If an FAA-owned distribution transformer is fed from an overhead line by means of a medium voltage cable, surge arresters of the metal-oxide varistor (MOV) type shall be installed at the pole top and at the transformer between each phase and ground. The pole type arrester shall be of the intermediate class, while the transformer surge arrester shall be of the distribution type. The continuous voltage rating of the arresters shall be determined in a protection and insulation coordination study. As a further protection against direct lightning, intermediate arresters shall be installed one span before and after the interconnection of transformer. Surge arrester leads connecting to cable conductor and grounded metal shield must be as short as possible to minimize the protective voltage level. This recommended surge protection scheme is illustrated in Figure 5.8.3-1.

b. If an FAA-owned distribution transformer is fed from a station transformer directly by means of a medium voltage underground cable, a distribution arrester shall be installed at both ends of the cable in accordance to the guidelines provided in paragraph (a) above.

c. Install surge arrestors of the proper class on transformers.

d. Unless otherwise shown on the drawings, surge arresters are not required on medium-voltage switchgear and sectionalizers.

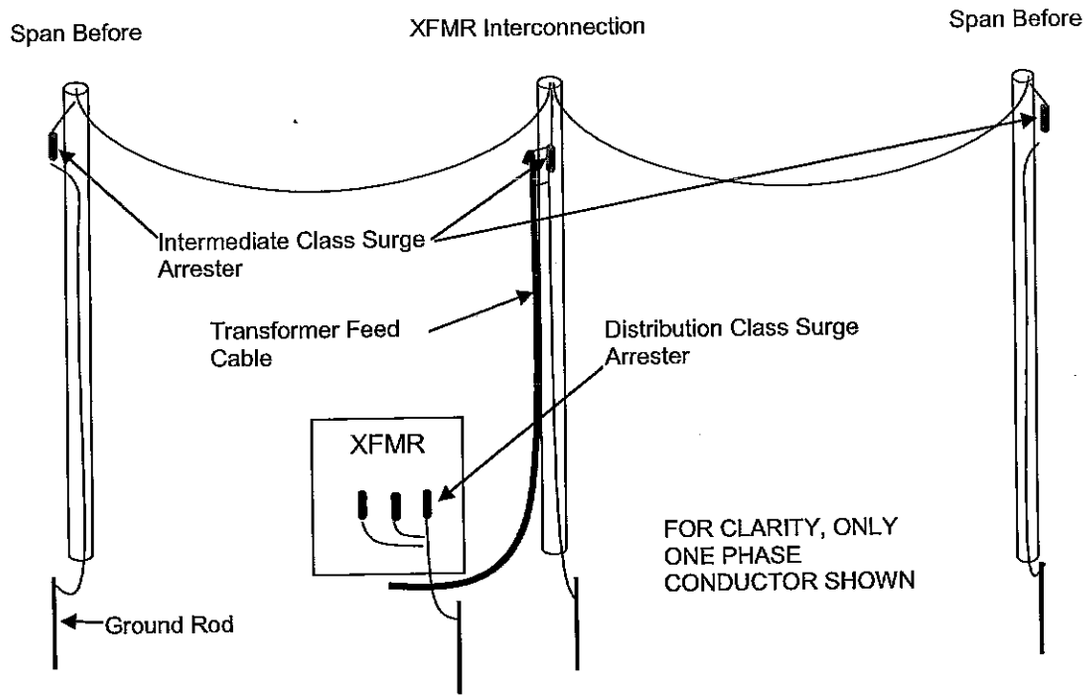


FIGURE 5.8.3-1. Schematic representation of recommended surge protection system.

5.8.4 Fault isolation

Use sectionalizers to protect the underground electrical line distribution circuit as a whole from electrical faults. This shall be accomplished by isolating faults to single National Airspace System (NAS) facilities versus multiple facilities ("daisy chained"). Where existing power cable layouts do not permit the isolation of individual facilities, add a sectionalizer.

Similarly, do not connect transformer primaries in a given electrical line distribution (ELD) service together in parallel such that a single power cable or transformer fault upstream will be allowed to deenergize downstream loads in the ELD circuit, thereby disabling multiple NAS facilities.

5.9 Splices

Whenever possible and while still meeting required cable grounding standards, splices are to be avoided. Splices on multiple cables in a trench shall be staggered. Cable ends to be spliced shall be kept free from moisture by using tape or caps. Cable runs shall be given continuity and insulation resistance tests per this specification at the completion of each splice. When conducting FAA-authorized third-party testing, at the completion of the installation of each cable section (from termination to termination), subject the cable section to a 50/60 Hz partial discharge test in accordance with IEEE 400.3 at up to 2.5 times operating voltage level for a duration not to exceed 30 seconds, while the cable section is disconnected from the rest of the

system. Any partial discharge within a splice shall comply with the requirements of IEEE 404. Splices are not to be drawn inside of any conduit or duct.

Buried and nonseparable T and Y joints shall not be used. These joints are inherently unreliable and cannot be properly commissioned with partial discharge diagnostics. Finding a fault becomes more difficult and harmful to existing cable assets. In addition, faults due to these types of unreliable joints can cause failures in multiple facilities due to a lack of sectionalizing.

Each cable splicer shall be qualified in making cable splices and in the use of specified cable splicing kits and specialized tools. The contractor shall obtain FAA authorization of the splice and cable splicer prior to making field splices. Cable splicing methods and materials shall be of a type recommended by the splicing materials manufacturer for the cable to be spliced, and a cable manufacturer's representative shall be present at least in the initial phase to provide guidance to the installation team. Splices shall be as follows.

a. Medium voltage power cables (600 volts and above). Use cold-shrink splice kits. The contractor shall make sure that the proper kit and tools are used for each application. The cold shrink product shall meet ANSI/IEEE Std. 404 (for a 15 kV rating).

b. Power cables 600 volts and below. Use heavy-wall self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006, poured epoxy splice, or any other splicing means approved by ANSI standards.

c. Cable armor and shields. Armor and shield may be folded back prior to splicing, then reinstalled across the splice and bonded by the use of authorized bonding clips, or soldering when copper material is used. If the armor is galvanized material, it shall be bolted. Excess threads should be cut from bolts and wrapped with butyl tape so there are no sharp projections prior to using heat-shrink tubing.

d. Evaluation of products. As a submittal to FAA, the contractor shall provide the product drawings showing details of the splicing methods to be used, and a statement documenting the 3-year experience qualification of the contractor in making splices on underground systems with the proposed product (reference FAA Advisory Circular 150/5370-10). In addition, products shall meet the latest editions of standards in Table V.

TABLE V. Cable splicing specification equivalents.

APPLICATION STANDARD	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

5.10 Equipment racks and disconnect switches

Equipment racks - If vertical supports for equipment racks supporting disconnect switches are separated by more than 6 feet, add a middle (third) vertical support.

Main disconnect switches – Ensure that installed MDSs meet NEMA 3R for typical applications, NEMA 4X for corrosive environments. If required by the designer, use bollards to protect the installation from vehicle impacts. Construct pads of concrete, or use prefabricated composite pads.

Lightning protection of equipment racks – Air terminals shall be installed on each end of an equipment rack, regardless of rack width or proximity to a zone of protection of other nearby facilities. Air terminal selection and grounding shall conform to FAA-STD-019.

5.11 Grounding of ELD systems

Local published standards may take precedence over the national standard. In the case of ambiguity or significant deviation, contact Power Services Group, Power Cable Program Office, to provide a technical evaluation. ELD system grounding shall comply with FAA-STD-019, NFPA 70, IEEE C2, and in accordance with the specific guidance provided herein.

Typical FAA medium-voltage ELD elements to be grounded include:

a. Power Cables – ground the multigrounded neutral wires and shields,
b. Guard wires,
c. Manholes and hand holes,
d. Equipment and equipment enclosures,
e. Surge arresters,
f. Steel conduits and fittings based on application,
g. Direct earth buried power cables – multigrounded shields,
h. Abandoned power cables--ground the conductor(s) and the multigrounded neutral wires and shields (if present).

Typical FAA low-voltage ELD elements to be grounded include:

a. Low-voltage cable segment between a facility transformer and the service entrance,
b. Service entrance disconnects, meter bases, and associated equipment,
c. Service entrance equipment racks.

5.11.1 Power cables, multigrounded neutral wires and shields

The FAA ELD systems follow the same practice as multigrounded (solidly grounded, reactance grounded) medium voltage neutral systems in common use by the electric utility companies.

FAA power cables (both in conduit and DEB) shall be effectively grounded by ground connections of sufficiently low impedance levels (< 7 ohms), and have sufficient current carrying capacity to limit the buildup of voltages to levels below those that may result in undue hazards to persons or connected equipment.

Multigrounded system—FAA medium voltage cables typically use metallic shields that require grounding (NEC requirement above 5 kV). The shields confine electric fields within the cable to obtain uniform radial distribution of the electric field, protect against induced voltages, and reduce the shock hazard risk to personnel. To effectively ground the shield, install multiple grounds to the cable neutral conductor to limit the voltage rise to 25 volts maximum (measured from neutral to earth ground) per IEEE Std 525. This shall be accomplished by connecting the neutral of the multigrounded system to electrodes at each transformer location and at a sufficient number of additional points totaling not less than four ground points in each mile of the entire line (every 1300 ft / 400 m [¼ mile], or less), not including grounds at individual services. This rule applies to underground jacketed shielded cable and to jacketed concentric neutral cable. (Ref NESC Section 9, Rule 096, *Ground Resistance Requirements – Multigrounded System).* The same practice applies to different kinds of cables; for example, concentric wire, tape shield, etc.

Bonding across joints--Apply a shield bonding jumper wire across cable splices.

DEB cable shield and separate neutral conductor grounding – Ground direct earth buried cable shields and shields of separate neutral conductor cables at least eight times per mile (not to exceed 660 ft spacing), not including grounds at individual services, in accordance with NESC C2, Rule 354.D.3c).

Service Laterals--For service laterals, when two disconnects are separated by 200 feet or more, neutral-to-ground bonds are required at both locations in accordance with the national electrical safety code (NESC). When the distance is less than 200 feet, the disconnect closest to the transformer shall have the neutral to ground bonded. Typically, this is the first disconnecting means in accordance with the National Electrical Code (NEC).

5.11.2 Cable guard wires

Guard wires protect the power cable from lightning surges. The contractor shall install cable guard wires for all buried cables and conductors not routed in ferrous conduit to protect underground conductors from the effects of lightning discharges. A 1/0 AWG bare copper stranded guard wire shall be used. The guard wire shall be embedded in the soil a minimum of 10 inches (25 cm) directly above, centered and parallel to the cable and/or duct to be protected.

When the width of the cable run or duct does not exceed 3 ft (90 cm), one guard wire centered over the cable run or duct shall be installed. When the cable run or duct is more than 3 feet (90 cm) in width, two guard wires shall be installed. The guard wires shall be spaced at least 12 inches (30 cm) apart and not be less than 12 inches (30 cm) or more than 18 inches (45 cm) inside the outermost wires or the edges of the duct.

The guard wire shall run continuously along the cable/duct run with no deviations from the run of the duct, and with no gaps. The guard wire shall be bonded to the earth electrode system (EES) at each end and to ground rods at approximately 90-foot intervals using exothermic welds. The spacing between ground rods shall vary by 10% to 20% to prevent resonance. Install the ground rods approximately 6 feet (2 m) on either side of the trench and connect them via jumper wire to the continuously running guard wire as shown in Figure 5.11.2-1. The jumper wires shall be swept away from the guard wire in a repeatable pattern such that a lightning impulse will always be able to follow a curved path to ground within 180 ft. of any point along the run. Maintain a minimum 9-in. radius bend in the jumper sweeps.

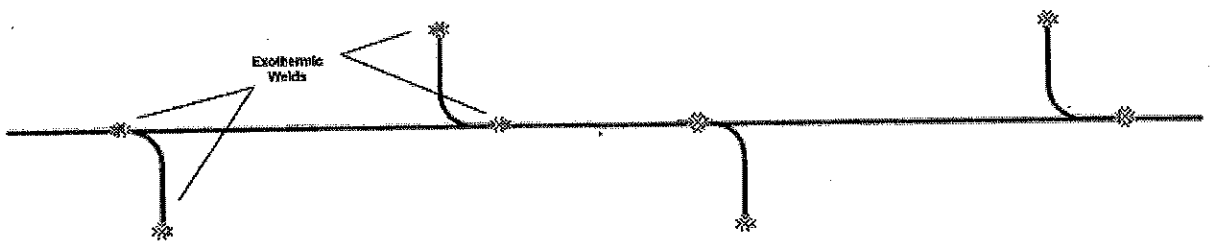


Figure 5.11.2-1 Grounding of cable guard wire. Note the alternating direction of the sweeps of the jumper wires. This pattern is required for the proper protection of the power cable.

For difficult excavations, such as rock formations or permafrost, the ground rods may be driven 3 feet on either side of the trench.

5.11.3 Manholes and hand holes

Power and control cables shall be installed in separate manholes and hand holes.

Until ready for acceptance testing, no installation work shall involve energized systems. Install power cables, ground wires, grounding loops, and manhole racks and furniture in such a way as to give maximum safe clearance space for personnel to enter the manhole when conducting subsequent operation and maintenance tasks. Conductors shall be placed well out of the way of human ingress/egress pathways through the manhole or vault. During acceptance inspection, manhole installation configurations that are found to be untidy and/or lacking in clearance for later maintenance tasks shall be required to be redone at the contractor's expense.

If space is available, cable slack sufficient for one splice for each cable shall be left in each manhole. Elimination or shortening of slack lengths shall require authorization by the FAA.

All new and existing cable in manholes shall be secured to nonmetallic racks on the manhole walls. Cables shall be secured to racks or mounted on a heavy duty nonmetallic multi-mount cable support arm.

Jumper cables shall be routed in such a manner that through-air clearance between adjacent conductors, and between conductors and any metallic or grounded surface, is maintained.

Physical dimensions of manholes may be altered to fit requirements. The following procedure covers the minimum grounding requirements (Figure II):

a. Install a solid, bare copper bus bar inside the manhole, or alternatively, run a 4/0 bare copper conductor along the inside of the manhole, creating a grounding surface about 12 inches (12") above the finished floor. Arrange bus bar or conductor so as to avoid interference with duct entrances into the manhole, and construct of sufficient length to facilitate repair and future installation operations.
b. Bond all cable shields (or steel interlocked armor if used) to the bus bar in accordance with the manufacturer's directions. Bond other metallic bodies to the bus bar with a minimum 6 AWG bare copper conductor using mechanical connections and two-hole lugs.
c. Connect and exothermically weld the 1/0 AWG guard wires to the outside ground rods on each side of the manhole, ensuring 10 feet (10') distance from the outside of the manhole to the ground rod.
d. If feasible, all connections, sweeps, or curves in the grounding system shall be smooth and shall be of at least 8 inch (8") radius no matter what the orientation (vertical or horizontal).
e. All splices inside a manhole shall be solidly grounded, with jumpers running across the joints to connect the cable shields.
f. Mechanically connect and bond the manhole frame to the bus bar using two-hole lugs and a 6 AWG solid copper ground conductor.
g. Apply expandable foam duct sealant at openings to prevent water and gas from entering manholes.
h. Hand holes follow the same basic principles as above, with appropriate modifications.

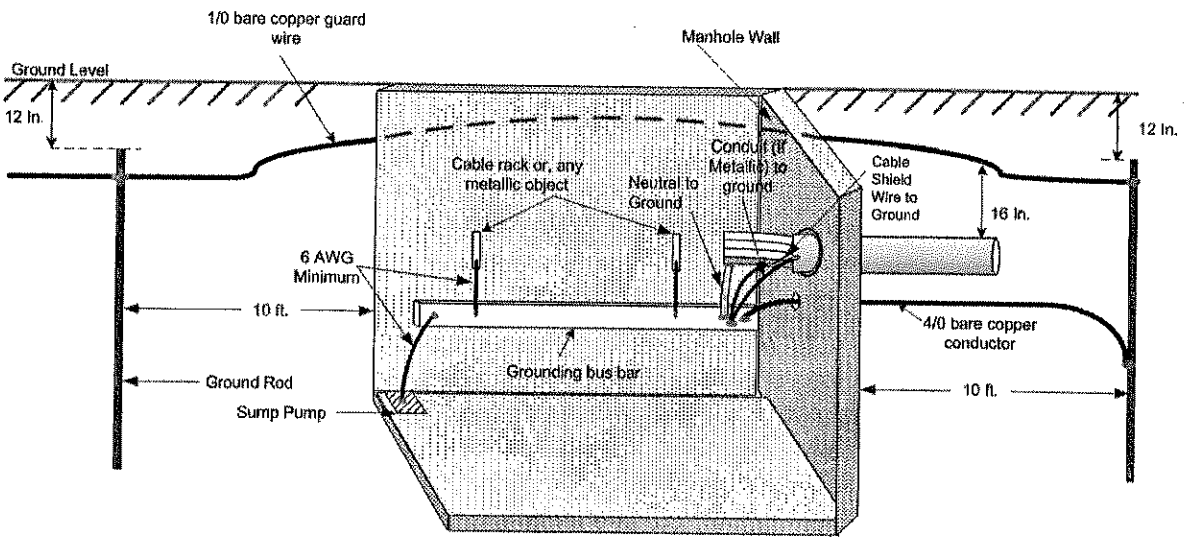


FIGURE 5.11.3-1. Grounding and guard wire installation detail at a manhole.

Where multiple conduits enter manholes, the following schemes illustrate guard wire grounding methods (all sharp corners to be rounded out) (Figure III).

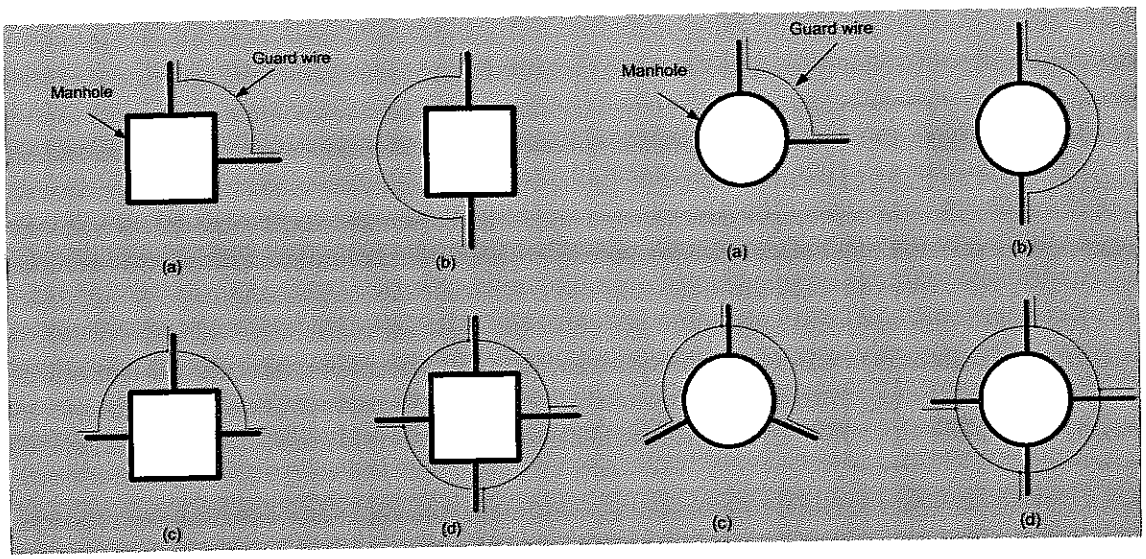


Figure 5.11.3-2. Guard wire grounding schemes.

5.11.4 Equipment and equipment enclosures

Where feasible, ground ELD equipment and equipment enclosures in accordance with NESC ANSI C2 Section 38, Rule 384 (for medium voltage equipment), FAA-STD-019 (for low voltage equipment), and IEEE 80 (when bonding grounding conductors to FAA NAS earth electrode systems).

For FAA ELD systems, ground rods shall be interconnected by a buried, bare, 4/0 AWG copper conductor (ground loop or counterpoise). Connections to the ground rods shall be exothermically welded. The interconnecting conductor shall close on itself forming a complete loop ("ground ring" or "counterpoise") with the ends exothermically welded.

Pad-mounted transformers and other pad-mounted equipment—At a minimum, install a single ground rod. Bond the transformer equipment frame and other non-current-carrying metal parts, such as cable shields, cable sheaths and armor, metallic conduit, and other non-current-carrying metal parts to the equipment counterpoise using exothermic welds. Ground the secondary neutral.

Equipment racks—Install a counterpoise 2' to 6' from equipment racks. Counterpoise shall consist of bare 4/0 copper conductors and driven ground rods around the rack. Ground the equipment rack and equipment and other non-current-carrying metal parts to the counterpoise using exothermic welds. If equipment rack is within 15 feet of a shelter having an existing FAA NAS EES, a connection between both counterpoises shall be made.

Connect metallic conduits that terminate without mechanical connection to the enclosure by grounding bushings and grounding conductor to the equipment ground bus.

Route cables within switchgear and enclosures in a manner which will allow room for bending and terminating of cables. Cables shall be secured in a manner that will not result in cable weight being placed on the termination electrical joint. Cable support shall be made in a manner that does not force cable against grounded metal or that compresses cable diameter. Cable training bend radius shall be at least 12 times cable diameter or shall not be installed.

Route jumper cables in a manner that maintains through-air clearance between adjacent conductors and between conductors and any metallic or grounded surface.

5.11.5 Surge arresters

Follow detail drawings in the drawing set for surge arrester grounding. For ungrounded and single-grounded systems, modify the requirement in accordance with IEEE C2 and UFC 3-550-03FA.

Bond surge arresters and neutrals directly to a transformer enclosure and then to the grounding electrode system using a bare copper conductor. Keep lead lengths as short as possible with no kinks or sharp bends.

5.11.6 Conduit and fittings

Conduit joints and fittings shall be electrically continuous between joined parts. Ferrous conduit enclosing power conductors to FAA facilities shall be terminated using conductive fittings to their respective junction boxes, equipment cabinets, enclosures, or other grounded metal structures.

5.11.7 Low-voltage cable runs to facility service entrances

The ELD low-voltage (≤ 600 V) cable runs coming from a commercial utility power meter and feeding power to FAA facility service entrances are considered to be FAA owned and operated utility distribution systems and shall follow the grounding and safety requirements of IEEE C2/NESC. Wiring after the distribution service delivery point (usually at the terminals of the service equipment but always as close to the FAA facility as possible) is generally considered premises wiring and shall follow NEC/NFPA 70 Section 250, *Alternating Current Systems between 50 V and 1000 V.*

For the grounding requirements of service laterals, consult the grounding section of this specification.

There are gray areas in determining which electrical safety and grounding codes apply (NESC or NEC); consult the office of primary interest to determine whether a segment is distribution or premises wiring.

5.11.8 Installation details

5.11.8.1 Installation of equipment counterpoise and ground rods

To meet site grounding requirements, install equipment counterpoise and ground rods according to the design drawings to ensure that the desired grounding values are achieved at all points of the ELD system.

Equipment counterpoise (pad mount loop) – Where not on or within 15 feet of an FAA NAS earth electrode system (EES), install bare 4/0 AWG copper conductors in a loop not less than 12 inches (12") below finished top of soil grade, or consistent with IEEE 80. Connect the counterpoise to ground rods using 4/0 AWG copper conductors and exothermic bonds.

When installing the pad mount loop on or within 15 feet of a NAS EES, a deeper burial depth may be required. Consult FAA-STD-019 or the project drawings.

Ground rods - Drive cone-pointed ground rods to full depth plus another 12 inches below grade. Ensure that the installation provides an earth ground of the appropriate value for the particular equipment being grounded. Neatly and firmly attach and exothermically weld ground rods to the counterpoise and keep the amount of exposed bare wire to a minimum.

5.11.8.2 Grounding and bonding connections at or within equipment enclosures

When feasible, where grounding connections are buried, external to equipment enclosures, or otherwise normally inaccessible and/or uninspectable, use exothermic welds. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds that are "puffed up" or that show convex surfaces indicating improper cleaning are not acceptable. No mechanical connectors shall be made below grade.

Mechanical connections within equipment enclosures above grade shall employ bolted solderless connectors, in compliance with UL 467.

5.11.8.3 Routing grounding and bonding conductors

Connect and bond transformer enclosures and equipment frames to the grounding counterpoise system. Size grounding and bonding conductors in accordance with the drawings. Bends less than 90 degrees are not permitted. Avoid routing ground conductors through concrete. When concrete penetration is necessary, cast nonmetallic conduit flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor. Seal the opening with a sealing compound after installation.

5.11.8.4 Grounding cable across expansion joints

For grounding cables that cross expansion joints or similar separations in structures and pavements, use approved devices or methods of installation to provide the necessary slack in the cable across the joint to permit movement. Use stranded or other approved flexible copper cable across such separations.

5.11.8.5 Grounding of armored cable and metallic conduit
Apply the following requirement during initial cable installation. For medium voltage systems, bond cable armor and/or metallic conduit to the earth electrode grounding systems of the connected equipment at both ends with a 2 AWG conductor, including at splices in manholes and hand holes. An armored bonding jumper shall be installed across each splice. For low voltage systems, bond the cable armor to the ground bus of the service disconnecting means at the electrical service entry point. Bonds shall be electrically continuous between joined parts (see FAA-STD-019).

5.11.8.6 Grounding metal splice cases
Ground metal splice cases for medium-voltage direct-burial cable by connection to a driven ground rod located within 2 feet of each splice box using a grounding electrode conductor having a current-carrying capacity of at least 20 percent of the individual phase conductors in the associated splice box, but not less than No. 6 AWG.

5.11.8.7 Grounding Riser poles
Directly connect equipment, neutrals, surge arresters, and items required to be grounded to the single continuous vertical ground rod conductor (No. 2 AWG minimum) on each riser pole. Ensure that ground rod conductors are stapled to wood poles at intervals not exceeding 2 feet.

5.12 Cable tagging, equipment markers and labels, and safety signs

5.12.1 Cable tags

Individual cables or groups of the same type of cable shall be clearly and unambiguously identified in accessible locations such as manholes, hand holes, junction boxes, and pull boxes by means of a minimum of two tags per cable, one near each duct entrance hole. Unless otherwise specified in the contract documents, cable tags shall be constructed of metal, or of rigid laminated plastic of at least 1/16" total thickness.

Plastic tags shall be exterior classified and consist of two plies: a plastic base and a 0.005" surface of impact acrylic plastic for front engraving. The tag shall be ultraviolet (UV) light stable. Engraving shall be done with 1/4-inch minimum lettering (white background and black letters). Tags shall be attached to the both terminated ends of the cable with two UV-rated nylon or stainless steel cable ties.

Cable terminations and potheads shall be tagged as to function, including facility which they serve, and any pertinent data. Tags shall be marked with an abbreviation of the name of the facility or facilities served by the cable plus the letter "P" (Power). Where more than one identical cable is used to serve the same facility, cables may be bundled under one tag unless job plans state otherwise.

5.12.2 Equipment markers and labels

Design and select equipment markers and labels for exterior use.

5.12.2.1 Exterior equipment identification tags, labels, and plaques
Aluminum tags, or any other tags or labels approved by the project engineer, shall be printed with numbers to identify ELD equipment. Attachment options include wires and ties, or screw mounts, nails, or bolts. Contrasting colors shall be considered when ordering tags and labels. Plaques may be made of laminated plastic.

5.12.2.2 Warning and safety signs and labels
To minimize accidents, manufacturers of electrical products use ANSI Z535, *Safety Alerting Standards,* to make their products and manuals safer. Contractors shall ensure that colors, safety signs and labels, safety symbols, barricade tapes, and information on product manuals, instructions, and collateral materials applying to FAA ELD equipment meet ANSI Z535.1 thru .6 standards.

5.12.2.3 Arc flash hazard labeling
In instances where an arc flash analysis has been completed and updated with any as-built changes, the results of the study shall be labeled on all corresponding equipment, as well as the drawings. Follow NEC Article 110.16 for guidance on warning labels.

Electrical equipment shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before installation of the equipment.

Following the completion of arc flash hazard and shock analyses, the electrical equipment evaluated shall be labeled to include the findings of the analyses. At a minimum, the label shall include the following information: flash hazard boundary; incident energy (calories/cm^2) at appropriate working distances; personal protective equipment (PPE) level - including what fire-retardant clothing is required; shock hazard level (kV); limited approach boundary (feet/inches); restricted approach boundary (feet/inches); class of voltage-rated gloves for restricted approach boundary; prohibited approach boundary (feet/inches); class of voltage-rated gloves for prohibited approach boundary; equipment name; additional PPE required (ear, eye, face, and/or head protection); and date of survey.

5.13 Cable markers

5.13.1 Concrete markers for DEB cable

Concrete markers are required only for direct earth buried (DEB) cables. Install a concrete slab marker at each change of direction of DEB cable, over the ends of ducts or conduits which are installed under paved areas and roadways, and over each splice. Markers shall be two feet (2') square and six inches (6") thick, and shall be installed within 24 hours of the final backfill of the cable trench. The markers shall be installed flat in the ground with the top approximately one

inch (1") above the finished grade. Install slabs so that the side nearest the inscription on top includes an arrow indicating the side nearest the cable. Provide color, type, and depth of warning tape.

Concrete shall have a compressive strength of not less than 20 MPa (3000 psi) and have a smooth, troweled finish on the exposed surface. After the concrete marker has set a minimum of 24 hours, the top surface shall be painted bright orange with paint manufactured specifically for uncured exterior concrete. Markers shall not be installed in concrete or asphalt surfaces.

Each cable marker shall have the following information impressed upon its top surface:

a. The word "CABLE".

b. Name of facility served; for example, "ASR," "VORTAC," "ALS," etc.

c. The designation of the type of cables installed shall be shown on the marker. The type shall be marked with the following abbreviations: "P" for Power, "C" for Control, "T" for Telephone, and "R" for Coaxial (Radio Frequency).

d. An arrow to indicate the direction or change of direction of the cable run.

e. Any additional information as defined by the contract drawings.

f. The contractor shall obtain authorization from the FAA for the information to be impressed on the cable marker and for the method of impression. The letters shall be four inches (4") high, three inches (3") wide and one half inch (1/2") deep.

All cable and cable markers shall be coded with applicable color coding standards, as applicable to the locality. If no standard applies, use the American Public Works Association (APWA) color codes shown in Table VI.

TABLE VI. APWA color codes.

COLOR CODE	TYPE OF UNDERGROUND UTILITY
RED	Electric power lines, cables or conduits, and lighting cables
YELLOW	Gas, oil, steam, petroleum or other hazardous liquid or gaseous materials
ORANGE	Communications, cable TV, alarm or signal lines, cables, or conduits
BLUE	Potable water lines
GREEN	Sewers, storm sewer facilities and utilities, or their drains lines
PURPLE	Reclaimed water, irrigation, or slurry lines
WHITE	Proposed excavation
PINK	Temporary survey marking

The location of the ends of ducts shall be marked with concrete markers 2 feet (2') square and 6 inches (6") thick. The duct markers are to be installed in the same manner as cable markers, except the following shall be impressed upon their top surface:

a. The word, "DUCT".

b. Name of facility served; for example, "ASR," "VORTAC," "ALS," etc.

c. An arrow to indicate the direction or the change in direction of the cable route.

d. The number of conduits and the type of conduits: for example, 4-P/2-C.

e. Any additional information as directed by the FAA project engineer.

DEB cables shall be marked every two hundred feet (200') along a cable run, at each change of direction of the cable, and at each cable splice. Markers shall be either concrete or other type, or a combination of both as specified in the contract documents.

The markers used for DEB cables shall be impressed with a "P" for power cable.

5.13.2 Special-purpose and near-surface markers

Special-purpose and near-surface markers are used to indicate points of additional information. At a minimum, markers shall indicate the location of splices and the entrances of separate duct banks and/or bores. Other significant points may be required as field-determined. Appropriate-colored surface markers shall also be placed where crossing other utilities (for example, blue for water, orange for telephone, yellow for gas). Markers shall be either drilled into existing surfaces (for example, concrete edge of manhole or pavement) or set in a concrete slab square as above.

5.14 Acceptance and inspection procedures

After the installation of cable systems is completed, the FAA and/or its contractor shall perform acceptance/commissioning testing (refer to Appendix C). All safety procedures for energizing the systems following installation shall follow OSHA confined spaces regulations and NFPA 70E. Tests shall be conducted in the operational environment to confirm operational readiness of the ELD and to identify safety hazards involving any component of the ELD system that will support a system in the NAS.

If applicable, participants shall include the FAA project manager, project engineer(s), contract technical representatives, environmental, safety, real estate, power company contracts representative, airport authority representative, and airport staff.

Once acceptance tests are completed and the results accepted, the FAA shall take beneficial occupancy of the ELD system. This may occur in stages.

APPENDIX A—Surge Arrester Performance Data

1. SCOPE

This appendix provides surge arrester performance data for FAA medium-voltage (MV) electrical line distribution (ELD) systems. Surge arresters protect the following ELD system elements:

a. Overhead lines and distribution transformers (utility responsibility),
b. MV transformers and cable installations,
c. MV cables,
d. Internal switchgear and sectionalizers in MV networks,
e. Other ELD-related special-purpose applications as required.

2. APPLICABLE DOCUMENTS

2.1 Non-government publications

Institute of Electrical and Electronics Engineers (IEEE)

IEEE C62.11 (2005; And 1 2008)
Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)

Guide Information for Electrical Equipment, The White Book 2011, and UL Product Categories Correlated to the 2008 and 2011 National Electrical Code®. Surge Arresters 1000 Volts and Higher (VZQK)

National Electrical Manufacturers Association (NEMA)

NEMA LA 1 (1992; R 1999) Standard for Surge Arresters

National Fire Protection Association (NFPA)

NFPA 70 (2008; TIA 08-1) National Electrical Code

NEC article 280: Introduces surge arresters, general requirements, installation requirements, and connection requirements.

3. REQUIREMENTS

3.1 Performance Requirements

3.1.1 General

The requirement is for high-quality metal-oxide surge arresters for use in FAA-owned distribution networks to ensure the protection of underground power cables, low-level distribution transformers, generators, sectionalizing switches, and other electrical equipment. Surge arresters limit dangerous voltage surges caused by lightning strikes or switching anomalies occurring in the ELD network. Arresters also increase the availability of power by reducing outages. Voltage surges can result in personnel injuries from electrical shock, insulation damage to equipment, and possibly fire. Surge arresters provide safe dissipation of these surges.

The standard root-mean-square (rms) maximum continuous operating voltage (MCOV) and rms duty-cycle voltage ratings for typical nominal voltage values and configurations used in FAA underground electrical distribution systems (except note 1) are shown in the table below. Light-duty surge arresters in common use in FAA ELD systems correspond to these configurations.

Nominal Voltage (KVrms)	MCOV (KVrms)	Duty-Cycle (KVrms)
4,160Y (3φ) 2,400 (1φ)	5.1 KV 2.55 kV	6 KV 3 kV
13,200Y(3φ) 7,620 (1φ)	15.3 KV 7.65 kV	18 KV 9 kV
4,160Δ (3φ)(see note 1)	5.1	6 kV
13,800	15.3 kV	18 kV

Note (1): The delta configuration is not a typical FAA ELD configuration. If you encounter this configuration or any configuration not shown above, call the Power Cable Program Office, AJW-22, for guidance.

3.1.2 Placement

Surge arresters shall be provided on the line side of:

1. Pole-mounted transformers (utility responsibility in most cases),

2. Overhead to underground terminal poles (utility),

3. All "normally open" switchways of pad-mounted sectionalizing switches connected to and served from overhead lines, THERE ARE NONE. ELIMINATE? ASK MATT M. AT IMCORP

4. Underground primary metering installations connected to and served from overhead lines.

5. On the line side of any location where a voltage/facility transition occurs.

3.1.3 IEEE Standard C62.11

The design, fabrication, testing, and performance requirement to which a medium voltage surge arrester shall comply is IEEE C62.11 (reference provided above). The definition provided in IEEE C62.11 for metal-oxide surge arresters for ac power circuits greater than 1 kV is:

> **Arrester, distribution, light duty class:** An arrester normally installed on and used to protect underground distribution systems where the major portion of the lightning stroke current is discharged by an arrester located at the overhead line/cable junction.

This class of surge arrester conforms to the minimum recommended level to provide protection against switching and other transient voltages in the underground ELD infrastructure. Light duty class arresters are constrained by the prescribed test requirements of standard IEEE C62.11 (see table below).

Surge arrester test requirements

Class	Rated voltage (kV)		Lightning impulse classifying current (kA)	Minimum High current Short duration withstand (kA)	Minimum Low current Long duration withstand (A, µs)
	Duty cycle	MCOV			
Distribution, light duty	3–36	2.55–29	5	40	75, 2000

3.1.4 Service conditions

An arrester installed in the FAA ELD system shall be capable of successful operations under the service conditions given in the paragraphs below.

3.1.4.1 Usual service conditions

Physical conditions

a) Ambient air temperature in the general vicinity of the arrester shall be between –40°C and +40°C except that: (1) Ambient air temperature in the general vicinity of dead front arresters shall be between –40 °C and +65 °C, and (2) Ambient liquid temperature in the general vicinity of liquid-immersed arresters shall be between –40°C and +95°C.
b) Maximum temperature of the arrester, due to external heat sources in the general vicinity of the arrester, shall not exceed 60°C, except that (1) Maximum temperature of the dead front arrester shall not exceed 85°C, and (2) Maximum temperature of the liquid-immersed arresters shall not exceed 120°C.
c) Altitude shall not exceed 1800 m (6000 ft), except for liquid-immersed arresters.

System conditions

a) Nominal power system frequency of 48 Hz to 62 Hz.
b) System line-to-ground voltage within the ratings of the arrester under all system operating conditions.

3.1.4.2 Unusual service conditions. Exposure to any of the service conditions described in the sections below may require special consideration in the design or application of arresters.

Physical conditions

a) Ambient temperatures in the general vicinity of the arrester exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
b) Maximum arrester temperatures exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
c) Altitude exceeding 1800 m (6000 ft). Arresters for service at higher altitudes shall be suitable for operation at either of the following altitude ranges:
   i) 1801–3600 m (6,001–12,000 ft).
   ii) 3601–5400 m (12,001–18,000 ft).
d) Exposure to any of the following:
   i) Damaging fumes or vapors
   ii) Excessive dirt, salt spray, or other current-conducting deposits.
   iii) Steam.
   iv) Explosive atmospheres, abnormal vibrations, or shocks
e) Limitation on clearances to nearby conducting objects, particularly at altitudes exceeding 1800 m (6000 ft)
f) Unusual transportation or storage.

System conditions

a) Nominal power frequency other than 48 Hz to 62 Hz
b) System operating conditions whereby the ratings of the arrester may be temporarily exceeded. Some examples are as follows:
   i) Loss of neutral ground on normally grounded circuit
   ii) Generator overspeed
   iii) Resonance during faults upon loss of major generation
   iv) System instability
   v) Persistent single line-to-ground fault on ungrounded three-phase systems
c) Any other unusual conditions known to the user.

APPENDIX B—Cable Pulling Calculations

This appendix provides basic information on how to calculate maximum pull force during cable pull operations. For detailed information and more elaborate tables, consult the cable manufacturer. Industry software is readily available to assist with these calculations.

1. To calculate cable pulling force for a cable consisting of several segments, and/or where a cable bends around a curve or a number of curves, calculations are done in incremental segments/steps using formulas and tables, with the segments/steps added together to arrive at the cumulative maximum pull tension. Add an additional 15% margin for safety. To illustrate the cumulative method, an example is given: the pull force calculated for a cable segment A is added to a "bend multiplier" AB, a pull force for straight cable segment B, a pull force for cable segment C, a bend multiplier CD, and a cable segment D, etc., plus 15%.

The basic formula for calculating maximum pulling tension in a single cable section is:

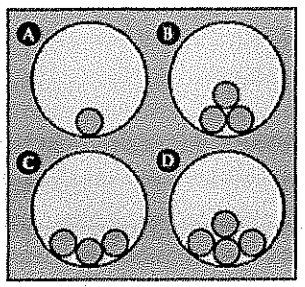
$T = L \times w \times f \times W,$

where
T is the total pulling tension (lb),
L is the length (ft) of cable being pulled,
w is the total weight (lb/ft) of the conductors,
f is the coefficient of friction (usually 0.5 for well-lubricated conditions),
W is the weight correction factor.

2. The process for calculating pull force for a segment of a cable run is as follows:

a. Enter the length of the cable segment in the formula above.
b. Enter the weight of the cable segment.
c. Enter the coefficient of friction.
d. Enter the weight correction factor W, derived as follows:
   i. Determine the geometric position of how the cables will lay in the conduit.
   ii. Calculate W using the table below.
e. Check for jamming hazard of the cables in the conduit.
f. Check sidewall bearing pressure (SWBP).
g. Check headroom.

3. The weight correction factor (W) calculation is based on the cable geometry in the duct:



A = Single; B = Triangular; C = Cradled; D = Diamond

To determine cable geometry, use the ratio of the conduit's inside diameter (D) to the cable's outside diameter (d) to find how the single conductors will sit in the conduit:

Triangular (Fig. B): This occurs when pulling three individual conductors from three separate reels, and their D/d ratio is less than 2.5. If pulling individual triplexed conductors from a single reel, the cables will also sit in this position.

Cradle (Fig. C): This position may occur when pulling three individual conductors from three separate reels, and their D/d ratio is between 2.5 and 3.0. This position is the least favorable because it yields the worst-case scenario of drag during the pull.

Diamond (Fig. D): This position occurs when pulling four individual conductors from four separate reels, and their D/d ratio is less than 3.0. If pulling quadruplexed individual conductors from a single reel, the multiconductor cable will also sit in this position.

No. of Conductors	Position	Weight Factor Equation
1	Single	$W = 1$
3	Triangular	$W = 1 / \{1-[d/(D-d)]^2\}^{1/2}$
3	Cradled	$W = 1 + \{(4/3) \times [d/(D-d)]^2\}$
4	Diamond	$W = 1 + \{2 \times [d/(D-d)]^2\}$
W = Weight correction factor D = Inside diameter of conduit d = Outside diameter of individual conductor		

For the most conservative calculation, use the cradle configuration.

4. Jamming ratio. When sizing the conduit system, installers must consider the possibility of cables jamming or wedging. This usually occurs when three or more individual conductors lie side by side in a single plane. As the conductors are pulled through a bend, the curvature of the bend tends to squeeze the conductors together. Use the following formula to determine the likelihood of jamming. Use the inside diameter of the conduit and the outside diameter of the individual conductor. Avoid jam ratios of 2.8 to 3.2 for Type MV extruded dielectric power cables:

$1.05 \times (D \div d)$

Where
D = the inside diameter of the conduit
d = the outside diameter of an individual conductor.
Constant factor 1.05 = correction for oval shape of bends in the sectional view.

- If the value is less than 2.5, the cable will jam,
- If the value is less than 3.0 but greater than 2.8, jamming is very possible,
- If the value is greater than 3.0, jamming will not occur.
- For medium-voltage extruded dielectric power cables, avoid values between 2.8 to 3.2.

5. Sidewall bearing pressure (SWBP). Sidewall bearing pressure (in pounds per foot) is the tension on the cable coming out of a bend (in pounds) divided by the inside radius of the bend (in feet). When pulling at a bend, the recommended maximum sidewall pressures for 15kV class and less is 500 lb/ft (or less, if recommended by the manufacturer).

No. of Conductors	**Position**	**SWBP Equation**
1	Single	$SWBP = T \div R$
3	Cradled	$SWBP = [(3W - 2) \times T] \div 3R$
3	Triangular	$SWBP = (W \times T) \div 2R$
4	Diamond	$SWBP = (W - 1) \times (T \div R)$
W = weight correction factor; T = calculated tension; R = radius of bend (inside radius).		

6. Headroom. To ensure a safe and easy pull, provide clearance between the uppermost conductor and the top of the conduit. For straight pulls, a clearance as small as ¼ in. is considered safe. For more complex pulls, between ½ in. and 1 in. is required. Use the equations below to derive the clearance for a given conduit and cable sitting position. Note that allowance is made for variations in cable and conduit diameters, and the oval shape of the raceway sections at bends.

Configuration	**Clearance**
Single	$C = D' - d'$
Triangular	$C = \left[\sqrt{D' - 1.366\,d'} + \sqrt{(D' - d')}\right] \times \sqrt{[1 - (d' \div D' - d)^2]}$
Diamond	$C = \left[(D' - d') - 2d'^2\right] \div (D' - d')$
C = Clearance, D' = 1.05 x nominal conduit inside diameter; d' = 1.05 x nominal overall diameter of individual conductor.	

7. Limit pulling tension to 0.008 lb/cmil for copper conductors pulled by pulling eyes or pulling bolts (pulling tension applied directly to the conductor).

8. Limit pulling tension to 1000 lb for jacketed cables pulled by cable grips.

9. Angle of bend. Every time there is a bend in the cable, a bend multiplier factor must be introduced:

Bend Angle	Multiplier
15	1.14
30	1.30
45	1.48
60	1.70
75	1.94
90	2.20
105	2.50
120	2.86

10. For steel, wire, rope, or tape used for cable pulling, a dynamometer graduated to indicate the tension on the cable being pulled can be used, or the contractor shall adapt a rope harness properly sized to limit pull tension to the value indicated. Any combination of a group of cables to be pulled into a duct shall not exceed the sum of individual allowable tension of each cable plus 15 percent.

APPENDIX C—Acceptance testing of newly installed FAA medium voltage underground power cables

This appendix specifies *acceptance testing* of newly installed FAA insulated underground medium voltage power cables rated 2 kV to 15 kV, shielded, non-shielded, and armored. It does not cover *installation testing* or *maintenance testing* as defined in IEEE 400.2. Nor does it cover testing of older, in-service cables. For comprehensive treatment of the maintenance testing of FAA power cables, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables.*

The testing guidance below applies to both direct burial cables and cables installed in nonmetallic and metal conduit. This appendix covers four types of tests used for validating acceptance of FAA medium voltage cables and accessories: (1) a continuity test, (2) an insulation resistance test; (3) an AC VLF field test; and (4) an offline 50/60 Hz partial discharge test. At a minimum, tests one through three (continuity, insulation resistance, and VLF withstand tests) shall be employed as acceptance tests of new FAA cable installations. Test four (offline PD test) is a state-of-the art test that provides the most thorough and exacting test data of all the choices. It can be substituted for the VLF withstand test if funding is available. The test must be conducted by a qualified third-party testing firm that is preapproved by the FAA, and requires extra lead time in planning the test activity (3 months).

Any newly installed cable that fails as a result of cable acceptance testing shall be replaced by the installation contractor at the installation contractor's expense.

The paragraphs that follow detail each test's theory of operation, parameters and tolerances, test schedules, and safety and test procedures. If any conflicts arise relating to power cable testing parameters, procedures, or safety as presented in this appendix, the guidance of FAA Order 6950.22 shall take precedence.

SAFETY REQUIREMENTS, GENERAL

The following are general safety requirements for all electrical power cable acceptance tests. Safety requirements particular to each test are provided in the tests' respective sections that follow.

Before testing is performed, ensure that cables and associated terminations are isolated from electrical apparatus such as power transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular "load break" elbow terminations are used on the cable, ensure that the load break elbows are inserted in the associated isolated parking bushings.

Ensure that all cables and terminations are disconnected and isolated from all sources of power. Using proper high-voltage test instruments, verify that the conductors are not energized and there is no back-feed from some unknown source.

Ensure that all cable shields, equipment grounding conductors, armor, and metallic conduits are properly grounded to the earth electrode system at both ends of the cable to be tested. If present, check to ensure that the cable shield, armor, and equipment grounding conductors are electrically continuous from one end of the cable to the other.

Refer to FAA Order 6950.22, Chapters 1 (Para. 105), 2 (Para. 220, 221, 222), and 5 (Para. 504), as well as applicable IEEE standards for more safety guidance.

1. INSULATION RESISTANCE TEST

1.1 Theory of Operation

After cable system installation and before the cable system is placed in normal service, a "limited voltage" DC insulation resistance test shall be performed and documented, including the testing of terminations and joints.

The insulation resistance test is classified by the IEEE as a diagnostic test. The purpose of the test is not to ensure the cable systems' future performance but simply to assure the construction team that the line is not grounded/shorted before energization. Insulation or dielectric resistance is the resistance to the flow of direct current through or over the surface of the insulating material. Cables are tested by measuring the resistance between conductors, and the resistance between each conductor and ground. For a new cable, or one that is believed to be in very good condition, all of these resistances should measure in megohms (for tolerances, see Section 1.2 of this appendix below).

Any insulation resistance values less than 50 megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations.

The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.2 Parameters and Tolerance limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE").

1.3 Test Schedules

Test after installation and just before energizing the new system.

1.4 Safety and Test Procedure

1.4.1 Safety

Follow safety practices as set forth in Chapter 2 (Para. 221e[2][c]) and 5 (Para. 502, 503) of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to the paragraphs that follow, and IEEE standards, for additional safety and grounding procedures.

Before testing begins, ensure that all associated cable shields, armor, equipment grounding conductors, and metallic conduit are properly grounded at both ends to an approved earth grounding systems or electrode. Verify that the conductors are not energized.

Ensure that cable shields and/or armor are electrically continuous by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only. All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor.

Insulation testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible "backfeed" from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less.***

1.4.2 Test Procedure

Refer to FAA Order 6950.22, Chapter 5, Para. 503 for detailed test procedures. The test procedures cover new cables having either 100% or 133% cable insulation ratings. In instances where the new cable to be tested is joined to an older cable, consult with the FAA project engineer to adjust the testing parameters as needed.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

1.4.2.1 New 2,000 to 5,000 Volt Cables, Terminations, and Joints
Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC Instruments Type 5070 or approved equal) applied incrementally up to the voltage rating of the cable for a duration of not to exceed 5 minutes. Do not exceed the rms line-to-ground voltage across the conductor and metallic shield. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 Megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.4.2.2 New 15,000 Volt Cables, Terminations, and Joints
Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC type 5070 or approved equal) applied incrementally up to 5,000 volts for a duration not to exceed 5 minutes. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 Megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

2. AC VLF FIELD TEST

2.1 Theory of Operation

The AC Very Low Frequency (VLF) (0.1 Hz sinusoidal) field test is essentially a DC Hipot test with a slow voltage oscillation to prevent the buildup of space charge in the cable insulation. The purpose of the test is not to ensure cable system future performance but simply to reassure the construction team that the line is not grounded/shorted before energization. The test is classified

by the IEEE as a destructive test because it is designed to bring a cable and/or accessory to failure where severe defects are present. Thus, the VLF withstand test is a pass/fail test and provides no localization or severity data other than the obvious outward sign of a defect upon failure. Only properly qualified persons who are VLF test-certified may perform this test on FAA ELD systems.

VLF withstand testing is performed after insulation resistance testing. Even if prior insulation resistance testing has indicated that the cable is in good condition, the VLF test may provide a further indication of cable reliability.

Because VLF testing can cause a severe defect in a cable, joints, and/or terminations to fail, provisions should be made to have personnel on-site to find the defective/faulted cable or termination and make the required repairs. Retest the cable after the repairs. Repeat this procedure until cable and terminations pass the VLF test. The installation contractor shall be responsible for repair or replacement of any failed components and retest costs.

2.2 Parameters and Tolerance Limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Also consult IEEE 400.2, *IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF).*

2.3 Test Schedules

Test after installation and just before energizing the new system.

2.4 Safety and Test Procedure

2.4.1 Safety

Follow general safety practices as set forth in Chapters 1, 2, and 5 of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to IEEE 400.2 for safety and grounding procedures, and to the paragraphs below.

VLF testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible "backfeed" from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Before testing is performed, ensure that all cables and associated terminations are disconnected and isolated from all sources of power, including electrical apparatus such as power transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from the electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular load-break elbow terminations are used on the cable, ensure the load-break elbows are inserted in the associated isolated parking bushings. Verify that the conductors are not energized and there is no back-feed from some unknown source.

Properly ground all associated cable shields, armor, equipment grounding conductors, and metallic conduit at both ends to an approved earth grounding systems or electrode. Ensure that cable shields and/or armor are electrically continuous from one end of the cable to the other by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only.

All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor. Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less!!!***

2.4.2 Test Procedure

If the new cable to be tested is joined to an older, in-service cable segment, consult with the FAA project engineer for guidance. The test voltage or other parameters may need to be adjusted for in-service cables because they are more sensitive to the high voltage levels attained during the test. Likewise, consult the FAA project engineer if two cable segments of different voltage ratings are being tested simultaneously, as the lower rated cable could be damaged by high voltage levels used to test the higher rated segment.

VLF testing is not required for cables with rated voltages less than 5,000 volts.

2.4.2.1 5,000 Volt Cables

For new 5,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at not to exceed 14,000 volts (peak) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

2.4.2.2 15,000 Volt Cables
For new 15,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at 28,000 volts (peak) using a VLF test set (High Voltage Inc., type VLF-28CM or approved equal) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

3. OFFLINE 50/60 Hz PARTIAL DISCHARGE TEST

3.1 Theory of Operation

The offline 50/60 Hz partial discharge (PD) test can identify the location and severity of a defect within the new cable or its accessories, including a latent defect missed by hipot tests.
The test uses a 50/60 Hz high-voltage power source and sophisticated signal processing/analysis to detect minute partial discharges (PD) in cable insulation, pinpointing manufacturing weaknesses and workmanship errors. It is a reliable method for detecting defects inadvertently missed during factory tests, defects introduced during transportation and installation, and flaws introduced while handling and splicing the cables. These defects frequently do not appear in normal voltage withstand tests but can eventually cause undesirable service failures weeks, months, or years into the future.

The test is classified by the IEEE as a diagnostic test and not a destructive test (i.e., it is not designed to cause cable and accessories to fail). Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm must be a qualified contractor preauthorized by the FAA.

3.2 Parameters and Tolerance Limits

The test is conducted in accordance with IEEE 400.3 using a maximum test voltage of 2.0 to 2.5 times operating voltage level (Uo) for a duration not to exceed 30 seconds.

For test parameters and tolerance limits, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 3, Standards and Tolerances, Paragraph 301, Table (see column heading labeled "NEW CABLE").

3.3 Test Schedules

Test after installation and just before energizing the new system. Allow adequate lead time for test planning with the third party testing firm: about 3 months before project completion for the initial notice, followed by 8 weeks' advance notice for setting up the information-gathering and detailed planning sessions.

3.4 Safety and Test Procedure

3.4.1 Safety

The third-party testing firm shall provide safety briefings at the beginning of each test session. See FAA Order 6950.22, Chapter 5, paragraph 504e(1) and applicable IEEE safety standards.

3.4.2 Test Procedure

For test procedure details, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 5, Paragraph 504.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

APPENDIX D—Acronyms/glossary

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current Advisory Circular
AJW-22	FAA Power Services Group
ALS	Approach Lighting Systems
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASR	Air Surveillance Radar
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge. A standard for expressing wire diameter. As the AWG number gets smaller, the wire diameter gets larger.
C	Clearance (cable pulling)
°C	Degrees Centigrade
CADD	Computer-Aided Design and Drafting
cmil	Circular Mil(s). Area of a wire that is one-thousandth of an inch (.001 inch, one mil) in diameter.
CN	Concentric Neutral
CONUS	Continental United States
CT	Current Transformer
d	Cable Outside Diameter (cable pulling)
D	Conduit Inside Diameter (cable pulling)
D'	D x 1.05 (cable pulling)
DC	Direct Current
DEB	Direct Earth Buried
DLA	Defense Logistics Agency
DOD	Department of Defense
Duct Bank	A set of parallel conduits made of steel, PVC covered, steel, heavy-walled PVC, or thin-walled PVC in reinforced concrete. Duct banks terminate in utility access holes or vaults. If not enclosed in concrete, duct banks must be of thicker material than thin-walled PVC.
EES	Earth Electrode System
ELD	Electrical Line Distribution (System). An underground or overhead electrical distribution system running from a power source to FAA facility load(s). An ELD may include some or all of the following: power cable; transformers; sectionalizers; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Intra-facility wiring, runway edge lighting cables, and FOTS and system cables, such as MALSR or ALSF loop cables are not included as part of ELD.
Electrical Trees	Tree-like growths consisting of non-solid or carbonized microchannels, which can occur at electric field enhancements such as protrusions, contaminants, voids, or water trees subjected to electrical stress for extended time periods. Partial discharges are responsible for electrical tree growth.
EPT	Electrical PVC Tubing

EPC	Electrical PVC Conduit
f	Coefficient of Friction (cable pulling)
FAA	Federal Aviation Administration
FOTS	Fiber Optic Telecommunications System(s)
ft	Feet
GIS	Geographic Information Systems
GPS	Global Positioning System
Grounding Conductor	A conductor used to connect equipment or the grounded circuit of a wiring system to the grounding electrode system.
Grounding Electrode	Copper rod, plate, or wire embedded in the ground for the specific purpose of dissipating electrical energy to the earth.
HAZMAT	Hazardous Materials
HDBK	FAA Handbook
HDPE	High-Density Polyethylene
HH	Hand Hole
HIPOT	High Potential (Test)
Hz	Hertz
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IECA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
in.	Inch(es)
ISO	International Standards Organization
JO	FAA Order
kg	Kilogram(s)
kV	Kilovolt(s)
L	Length of Cable (cable pulling)
lb	Pound(s)
LV	Low Voltage (Typically 600V and Below for ELD Systems)
m	Meter(s)
MCOV	Maximum Continuous Operating Voltage
MH	Manhole
mH	Millihenry(s)
MIL-STD	Military Standard
MIL-I	Military Specification
mil	Unit of Length, Equal to One Thousandth (10^{-3}) of an Inch (0.0254 millimeter)
mm	Millimeter
MOV	Metal Oxide Varistor
MV	Medium Voltage (600 V to 37.5 kV)
NAS	National Airspace System
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code

NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
OPR	Office of Primary Responsibility
OSHA	Occupational Safety and Health Administration
Pa	Pascal(s)
pC	Picocoulomb(s)
PD	Partial Discharge
PPE	Personal Protective Equipment
psi	Pounds per Square Inch
PSG	Power Services Group
PTFE	Polytetrafluoroethylene (Teflon™)
PVC	Polyvinyl Chloride
PWRFRQ	Power Frequency (Test)
Qualified Person (Electrical)	A person knowledgeable in the construction and operation of electric power generation, transmission, and/or distribution equipment, along with associated hazards. Also known as "qualified worker."
R	Radius of Bend (cable pulling)
rms	Root Mean Square
RMC	Rigid Metal Conduit
RSA	Runway Safety Area. Areas of a runway established to enhance safety in the event of an aircraft undershoot, overrun, or excursion from the side of the runway.
SDR	Standard Dimensional Ratio
SPD	Surge Protection Device
STD	FAA Standard
SWBP	Sidewall Bearing Pressure (cable pulling)
T	Total Pulling Tension (cable pulling)
TR-XLPE	Tree-retardant XLPE
TSA	Taxiway Service Area
U_o	Operating Voltage, Line to Ground
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specification (DOD). The UFGS was founded by the Secretary of Defense and mandated by the Department of Defense for all Military Services to unify their specifications into one database.
UL	Underwriters' Laboratory
UV	Ultraviolet
V	Volt(s)
VLF	Very Low Frequency
VORTAC	VOR/Tactical Air Navigation
w	Weight of Conductors (cable pulling)
W	Weight correction factor (cable pulling)
Xfmr	Transformer
XLPE	Cross-Linked Polyethylene

APPENDIX E--Submittals Matrix

Contractor-generated design data	
• Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2)	A Required.
• Design assumptions and parameters (FAA-STD-032)	B ☐ Required for this project (check block).
• Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc)	C ☐ Required for this project.
• Design calculations (FAA-STD-032)	A Required.
• Contractor-generated design drawings or sketches.	A Required.
Cost estimates	A Required.
Medium voltage cable	A Required.
Medium voltage cable splices and joints*	A Required.
Medium voltage cable terminations*	A Required.
Conduits	A Required.
Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc)	A Required.
Switch pads and sectionalizers	A Required.
Transfer switches (automatic and manual)	A Required.
Transformers	A Required.
Surge arresters	A Required.
Live end caps or protective caps	A Required.
Precast concrete structures	A Required.
Sealing Material	B ☐ Required for this project.
Manhole frames and covers	A Required.
Hand hole frames and covers	A Required.
Cable supports (racks, arms and insulators)	A Required.
Protective devices and coordination study	A Required.
As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system.	A Required.

Electrical equipment factory test reports		
Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13).	A	Required.
Transformers	A	Required.
Switchgear, sectionalizers	A	Required.
Disconnects	A	Required.
Other components	B ☐	Required for this project.
Field acceptance checks and tests (see Appendix C)	A	Required.
Arc-proofing test for cable fireproofing tape	C ☐	Required for this project.
Cable installation plan and procedure		
• Site layout drawing with cable pulls numerically identified	B ☐	Required for this project.
• list of equipment used, with calibration certifications	A	Required.
• The manufacturer, type, and quantity of lubricant used on pull	B ☐	Required for this project.
• The cable manufacturer and type of cable	A	Required.
• The dates of cable pulls, time of day, and ambient temperature	C ☐	Required for this project.
• The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table of cable pulls may be submitted.	A	Required.
• The actual cable pulling tensions encountered during pull	A	Required.
• Certificates (tensiometer calibration, VLF tester calibration, etc) [A]	A	Required.
Cable splicer/terminator qualifications* [A]	A	Required.
Cable installer qualifications* [A]	A	Required.
Project design drawings [A]	A	Required.

APPENDIX F—HDPE-to-HDPE and HDPE-to-PVC Conduit Adhesive - Sample Product

BonDuit®

Conduit Adhesive

American Polywater's

BONDS to Polyethylene, PVC, Fiberglass, Metals and more

BonDuit® Conduit Adhesive is a unique two-part adhesive system used to transition-splice conduits (innerducts) of different types. BonDuit® Adhesive in 5 minutes makes a strong, durable splice that is air/water tight. Requires no expensive equipment.

Estimated Load Capacity and Usage

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ¾ inch	760 lbs$_f$
1 ½ inch	2 ¾ inch	1,140 lbs$_f$
2 inch	2 ½ inch	1,520 lbs$_f$
4 inch	3 ¾ inch	4,560 lbs$_f$

Results are based on careful surface preparation and a 24-hour cure at 70° F. Under these cure conditions; the load will reach 50% capacity after one hour and fully cured in 24 hours. To create air-tight joints for air-assisted cable installation, a cure time of 2 hours at 70 °F is recommended. BonDuit® Conduit Adhesive is not designed for high stress pulls, such as those in HDD installations.

Numbers of Applications

BonDuit® Conduit Adhesive kit contain the materials necessary to prepare plastic and metal surfaces for bonding. By following the instructions, a strong joint takes just minutes. Each cartridge contains enough material for numerous applications, depending on the size of each coupling or joint.

Conduit Size	Applications per Cartridge
1 inch	20-30
1 ½ inch	12-18
2 inch	10-15
4 inch	4-6

Drawing No.	Title
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item FAA-C-13191d	Installation, Termination, Splicing, And Transient/Surge Protection Of Underground Electrical Distribution System Power Cables
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT

1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	3
Issued (Date):	August 4, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Extending the Construction Schedule, and Changing the Method of Measurement for P-152 Material.

- **Extending the Construction Schedule**

The construction schedule has been extended from 274 calendar days to 359 calendar days. Please find attached the updated Construction Safety and Phasing sheets from the construction drawings reflecting the new phase durations. The project manual has also been edited to reflect the new schedule. The following project manual sections reference the construction duration and have therefore been updated and included in this addendum: The Template Notice to Proceed; The Bid Form; The Contract.

- **Changing the Method of Measurement for P-152 Material**

Borrow material – governed by the P-152 specification – shall no longer be measured for payment in its original position at the borrow pit. Instead, it shall be paid for based on plan quantities as stated in the amended and attached P-152 specification.

Addendum No. 3 (Continued)

(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)

Donna Burke - Senior Project Administrator
Title of Person Signing Above

Triple B Services, LLP
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

XXXXXXX, 2017

XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX
XXXXXXXXXXX

Re: Jack Brooks Regional Airport
Taxiway D Reconstruction (2017); Jefferson County Contract 17-024/JW
AIP No. 3-48-0018-034-2017
Notice to Proceed

Dear Mr. _____:

Please consider this letter as your Notice to Proceed with construction on the above referenced project, effective XXXXXXX, 2017.

Under the terms of the Contract, contract time will start when construction begins or ten (10) days after the effective date of this Notice to Proceed, whichever comes first. Work must be completed within 359 calendar days of the start of contract time. Before you start work at the site, Special Provisions Section C-01 requires that you must deliver to the Engineer and Owner Certificates of Insurance which you are required to purchase and maintain in accordance with the Contract. As stipulated in the Contract Proposal, failure to complete the work within the contract time shall result in the assessment of liquidated damages. The damages are therein set in the amount of $1,000.00 per calendar day.

~~As required in Section 80-03, a construction schedule is to be submitted as soon as possible since no schedule was submitted at the pre-construction meeting of XXXXXXXXXXX, 2017.~~

Please call me if you have any questions.

Sincerely,

GARVER, LLC

Colin M. Bible, P.E.
Sr. Project Manager

CC: Alex Rupp, Jack Brooks Regional Airport (via email)

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-120-1	SITE PREPARATION	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$	$
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$	$
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$	$
	Unit price in words: _____ dollars and _____ /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$	$
	Unit price in words: _____ dollars and _____ /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$	$

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$	$
	Unit price in words: _____ dollars and _____ /100				
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$	$
	Unit price in words: _____ dollars and _____ /100				
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$	$
	Unit price in words: _____ dollars and _____ /100				
P-155-2	LIME	TON	600	$	$

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$ _____	$ _____

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
T-904-1	SODDING	S.Y.	1,405	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$ _____	$ _____

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: _____ dollars and _____ /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$_____	$_____
	Unit price in words: _____ dollars and _____ /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$	$
	Unit price in words: _____ dollars and _____ /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700		

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: _____ dollars and _____ /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$ _____	$ _____
	Unit price in words: _____ dollars and _____ /100				

TOTAL (BASE BID) $_____

Total price in words: _____ dollars and _____ /100

It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

CONTRACT

THIS AGREEMENT made this _____ day of _____, 2016, by and between **XXXXXX** a Corporation organized and existing under the laws of the State of **Texas** hereinafter called the "Contractor", and **JEFFERSON COUNTY, TEXAS**, hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the construction of **Taxiway D Reconstruction (2017) from Ware Ramp to Taxiway 'F' at Jack Brooks Regional Airport** in strict accordance with the Contract Documents.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the lump sum and unit prices stipulated in the Proposal for the **Base Bid, not to exceed a total contract value of: XXXXXXXXXXXXXXXX dollars and no /100 ($X,XXX,XXX.00)** subject to additions, and deductions as provided in the Section entitled "CHANGES IN THE WORK" under GENERAL PROVISIONS.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within **Three-Hundred and Fifty-Nine (359)** consecutive calendar days thereafter (except as modified in accordance with the GENERAL PROVISIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in the PROPOSAL of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

a. Advertisement and Invitation to Bidders
b. Instructions to Bidders
c. Bid Form and Proposal
d. Executed Contract
e. Statement of Bidder's Qualifications
f. List of Proposed Subcontractors
g. Performance and Payment Bonds
h. Certificates of Insurance and Insurance Policies
i. General Provisions (FAA AC 150/5370-10F)
j. Special Provisions
k. Addenda (if any)
l. Wage Rates
m. Technical Specifications
n. Drawings
o. Certificate(s) of Insurance

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any

provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner, authorized to do business in the State of Texas, and shall comply with applicable Texas laws.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

Name _____
(Contractor)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

_____
(Street)

_____
(City)

JEFFERSON COUNTY, TEXAS, _____
(Owner)

ATTEST: _____ By _____

_____ Title: _____
(Print the names underneath all signatures)

ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 CLASSIFICATION. All material excavated shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

~~**b. Rock Excavation.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as "rock excavation."~~

~~**c. Muck Excavation.** Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.~~

~~**d. Drainage Excavation.** Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.~~

e. Borrow Excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of *potentially* usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. *Material not considered by the Engineer to be suitable for use on the embankment slope shall be disposed of off-site or as directed by the Engineer. Undercuting of material unsatisfactory for subgrade foundation, roads, shoulders, or areas intended for turfing shall be considered unsuitable excavation and shall be excavated to the depth specified by the Engineer below the subgrade.*

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20 *of the General Provisions*. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as *described in paragraph 152-1.3* ~~shown on the plans.~~

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective Grading. When *the quality of material varies significantly* ~~selective grading is indicated on the plans~~, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas. ~~so that it can be measured for payment as specified in paragraph 152-3.3~~. *Selective grading will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of as directed in paragraph 152-1.3. This excavated material shall be paid for at the contract unit price per cubic yard for **unsuitable excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a *necessary part of Unsuitable Excavation* ~~part of the embankment~~. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained *as directed by the Engineer* ~~in accordance with the details shown on the plans.~~

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be

made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of *some* existing structures and utilities required to permit the orderly progress of work *may* ~~will~~ be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified. *All work associated with the excavation, removal, backfill, disposal, and/or stockpiling of existing structures and culverts will not be measured for separate payment but will be considered subsidiary to "Unclassified Excavation".*

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557.** The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

e. Proof Rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of **2** coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 BORROW EXCAVATION. ~~Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.~~

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross- section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted as indicated in paragraph 152-2.6.

When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 SY of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than ~~95% of maximum density for noncohesive soils, and~~ 90% of maximum density for cohesive soils *outside of areas to be paved. Maximum density is* as determined by ASTM **D 1557**. *Contractor's laboratory shall perform density test in the Engineer's presence and provide the test results upon completion to the Engineer for review.* Under all areas to be paved, the embankments shall be compacted to a depth of **8 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557**.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with **ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Engineer shall perform all density tests.**

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **500** feet of runway pavement or **250** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 ~~The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed~~] [~~The quantity of compacted embankment in-place to be paid for shall be the number of cubic yards measured in its final position.~~

Measurement of excavation/embankment shall be based on ***plan quantities****. These quantities are believed to be correct and shall be utilized for final excavation quantity payment not withstanding any adjustments to the project by written direction of the Engineer. Should the contractor find discrepancies and/or errors, he/she shall bring the discrepancy and/or error to the attention of the Engineer immediately and corrections shall be made to the quantity of excavation to be paid for by change order. It is expressly understood by the contractor that upon disturbance of the existing ground and no notification to the engineer of possible errors, that the contractor accepts as final payment the quantities of excavation as detailed on the plans and laid out in the proposal. No adjustment has been made to the plan quantities for the construction or demolition of existing drainage structures. The Contractor shall make his own determination as to the amount of unsuitable excavated material which may be encountered and the resulting additional borrow material required for the construction of the embankment. There will be no adjustment for additional embankment required to construct the project if the excavated material is deemed unsuitable.*

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards ~~measured in its original position at the borrow pit~~ *as based on plan quantities.*

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards measured in the stockpiled position as soon as the material has been stockpiled.

152-3.4 For payment specified by the cubic yard, measurement for all excavation and embankment shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation and embankment cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation and embankment operations and prior to the placing of base or subbase material, the final excavation and embankment shall be verified by the Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet.

In cut sections, the additional cut required to construct the topsoil layer to the plan grade has not been measured and will not be measured for separate payment but will be subsidiary to "Unclassified Excavation". In fill sections, the additional fill required to replace the stripped material has not been measured and will not be measured for payment but will be subsidiary to "Unclassified Excavation".

No allowance has been made in the measurement for shrink/swell. The Contractor shall make his own determination as to the amount of shrink/swell involved in the construction of the embankment.

The Contractor shall make his own determination as to the suitability of the excavated material to be placed in embankments and the resulting additional off-site material required for the construction of the embankment. Additional off-site material required for the formation of embankment shall not be measured for separate payment but shall be considered subsidiary to "Unclassified Excavation".

***152-3.6** Unsuitable excavation shall be measured from the surface of the ground, after stripping has been accomplished, or from the bottom of the planned excavation, to the depth of the excavation as directed by the Engineer. Measurements will be taken by the Engineer, and the volume of excavation will be calculated by the average end area method. The necessary refilling of unsuitable areas will not be measured for separate payment but will be subsidiary to "Unsuitable Excavation". Only that amount of excavation directed by the Engineer will be measured for payment.*

BASIS OF PAYMENT

152-4.1 "Unclassified excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.2** "Rock Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.3** "Muck Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.4** "Drainage Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 "Borrow Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

~~**152-4.6** "Stockpiled Material" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

~~**152-4.7** For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 Unsuitable excavation shall be paid for at the contract unit price bid per cubic yard for "Unsuitable Excavation", which price shall be full compensation for all excavation; for disposal or placement of unsuitable material (in accordance with section 152-1.3), including loading, hauling, spreading, and

compaction; for compaction and preparation of subgrade; for the refilling, rolling, and compaction of all undercut areas; and for all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item P-152-1	Unclassified Excavation - per Cubic Yard
Item P-152-2	Borrow Excavation - per Cubic Yard
Item P-152-3	Unsuitable Excavation - per Cubic Yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

Bidder Information Form

Instructions: Complete the form below. Please provide legible, accurate, and complete contact information. PLEASE PRINT.

Bid Name & Number: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport (IFB 17-024/JW)

Bidder's Company/Business Name: Triple B Services, LLP

Bidder's TAX ID Number: 76-0507104

Contact Person: Donna Burke **Title:** Senior Project Administrator

Phone Number (with area code): 281-324-3264

Alternate Phone Number if available (with area code):

Fax Number (with area code): 281-324-1304

Email Address: donna@triplebservices.com

Mailing Address (Please provide a physical address for bid bond return, if applicable):

820 Old Atascocita Rd.
Address
Huffman, Texas 77336
City, State, Zip Code

OFFER AND ACCEPTANCE FORM

OFFER TO CONTRACT

To Jefferson County:

We hereby offer and agree to furnish the materials or service in compliance with all terms, conditions, specifications, and amendments in the Invitation for Bid and any written exceptions in the offer. We understand that the items in this Invitation for Bid, including, but not limited to, all required certificates are fully incorporated herein as a material and necessary part of the contract.

The undersigned hereby states, under penalty of perjury, that all information provided is true, accurate, and complete, and states that he/she has the authority to submit this bid, which will result in a binding contract if accepted by Jefferson County.

We acknowledge receipt of the following amendment(s): 1, 2, 3, _____.

I certify, under penalty of perjury, that I have the legal authorization to bind the firm hereunder:

Triple B Services, LLP
Company Name

820 Old Atascocita Rd
Address

Huffman | Texas | 77336
City | State | Zip

Donna Burke
Signature of Person Authorized to Sign

Donna Burke
Printed Name

Senior Project Administrator
Title

For clarification of this offer, contact:

Donna Burke
Name

281-324-3264 | 281-324-1304
Phone | Fax

donna@triplebservices.com
E-mail

Bidder Shall Return Completed Form with Offer.

SECTION C
BID FORM AND PROPOSAL

BID FORM AND PROPOSAL

Place Jefferson Co Purchasing

Date August 8, 2017

Proposal of _____,

a corporation organized and existing under the laws of the State of _____,

or

Proposal of Triple B Services, LLP,

a partnership consisting of Charles, Keith & Kevin Burke

or

Proposal of _____,

an individual doing business as _____,

To: Jack Brooks Regional Airport

This bid results from your advertisement for bids for the construction of the **Taxiway D Reconstruction (2017), Ware Ramp to Taxiway 'F'.**

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents including all Addenda, and being familiar with all of the conditions relating to the construction of the proposed project, hereby agrees to comply with all other conditions or requirements set forth in the Plans, Specifications, and other Contract Documents, and further proposes to; furnish all material, supplies, equipment, and appliances; to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Plans, Specifications, and other Contract Documents at and for the unit prices proposed in the attached Bid Form(s).

The undersigned Bidder agrees to begin work within ten (10) calendar days after the issuance by, or on behalf of, the Owner of a "Work Order" or "Notice to Proceed" (except as modified in accordance with the GENERAL FAA PROVISIONS of these Contract Documents). Should the work fail to be completed within the time herein stated, the Contractor shall pay to the Owner, as fixed and agreed liquidated damages, and not as a penalty, the sum, for each day of delay until the work is completed and accepted, as stipulated in GENERAL FAA PROVISIONS of these Contract Documents. It is understood that additional time for the completion of the project is to be allowed only for delays as stipulated in GENERAL FAA PROVISIONS of these Contract Documents.

List of Plans

Drawing No.	Title
G-101	COVER SHEET
G-102	SHEET INDEX AND SUMMARY OF QUANTITIES
G-103	GENERAL NOTES
G-201	PROJECT LAYOUT AND SURVEY CONTROL PLAN
G-301	SAFETY AND PHASING PLAN
G-302	SAFETY AND PHASING DETAILS
G-303	SAFETY AND PHASING - PHASE I

Drawing No.	Title
G-304	SAFETY AND PHASING - PHASE II
G-305	SAFETY AND PHASING - PHASE III
G-401	GEOTECHNICAL INVESTIGATION PLAN
C-101	TYPICAL SECTIONS
C-201	SWPPP DETAILS I
C-202	SWPPP DETAILS II
C-203	SWPPP NOTES
C-204	SWPPP LAYOUT
C-301	EXISTING CONDITIONS LAYOUT I
C-302	EXISTING CONDITIONS LAYOUT II
C-401	DEMOLITION DETAILS
C-402	DEMOLITION LAYOUT
C-501	GRADING AND DRAINAGE DETAILS I
C-502	GRADING AND DRAINAGE DETAILS II
C-503	GRADING AND DRAINAGE PLAN I
C-504	GRADING AND DRAINAGE PLAN II
C-601	STORM DRAIN PROFILES AND CALCULATIONS I
C-701	GEOMETRIC PLAN I
C-702	GEOMETRIC PLAN II
C-801	PAVEMENT PROFILE I
C-802	PAVEMENT PROFILE II
C-901	JOINTING DETAILS
C-902	JOINT LAYOUT PLAN I
C-903	JOINT LAYOUT PLAN II
C-1001	JOINT ELEVATIONS LAYOUT I
C-1002	JOINT ELEVATIONS LAYOUT II
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M-102	MARKING REMOVAL PLAN I
M-103	MARKING REMOVAL PLAN II
M-103	MARKING AND SIGNAGE LAYOUT I
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XS-101	TAXIWAY D CROSS SECTIONS I
XS-102	TAXIWAY D CROSS SECTIONS II
XS-103	TAXIWAY D CROSS SECTIONS III
XS-104	TAXIWAY D CROSS SECTIONS IV
XS-105	TAXIWAY D CROSS SECTIONS V
XS-106	TAXIWAY D CROSS SECTIONS VI
XS-107	TAXIWAY D CROSS SECTIONS VII
XS-108	TAXIWAY D CROSS SECTIONS VIII
XS-109	TAXIWAY D CROSS SECTIONS IX
XS-110	TAXIWAY D CROSS SECTIONS X
XS-111	TAXIWAY D CROSS SECTIONS XI
E-001	ELECTRICAL LEGEND AND NOTES
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E-102	LIGHTING REMOVAL PLAN II

Drawing No.	Title
E-201	LIGHTING INSTALLATION PLAN I
E-202	LIGHTING INSTALLATION PLAN II
E-301	ELECTRICAL DETAILS I
E-302	ELECTRICAL DETAILS II
E-303	ELECTRICAL DETAILS III
E-304	ELECTRICAL DETAILS IV
E-305	ELECTRICAL DETAILS V
E-306	ELECTRICAL DETAILS VI
E-307	ELECTRICAL DETAILS VII
E-308	ELECTRICAL DETAILS VIII
E-309	ELECTRICAL DETAILS IX
E-310	ELECTRICAL DETAILS X
E-311	ELECTRICAL DETAILS XI
E-312	ELECTRICAL DETAILS XII

List of Technical Specifications

Specification Item No.	Description
Item SS-100	Construction Safety and Phasing Plan
Item SS-101	Contractor Safety Plan Compliance Document
Item SS-110	Standard Specifications
Item SS-120	Site Preparation
Item SS-300	Basic Electrical Requirements
Item SS-301	Electrical Demolition and Relocation Work
Item SS-305	Directional Boring
Item SS-310	Airport Lighting Systems
D-701	Pipe for Storm Drains and Culverts
D-751	Manholes, Catch Basins, and Inspection Holes
P-101	Surface Preparation
P-152	Excavation and Embankment
P-154	Subbase Course
P-155	Lime-Treated Subgrade
P-156	Temporary Air Water Pollution Soil Erosion and Siltation Control
P-501	Portland Cement Concrete Pavement
P-605	Joint Sealing Filler
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Painting
P-631	Refined Coal Tar Emulsion with Additives, Slurry Seal Surface Treatment
T-901	Seeding
T-904	Sodding
T-905	Topsoiling
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures

Bidder acknowledges receipt of the following addendum (addenda):

Addendum No. 1 dated 7·25·17

Addendum No. 2 dated 8·2·17

Addendum No. 3 dated 8·4·17

The undersigned Bidder agrees that this bid shall be good and shall not be withdrawn for a period of ninety (90) calendar days after the opening thereof. If written notice of the acceptance of this Proposal is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the opening thereof, or at any time thereafter before this Proposal is withdrawn, the undersigned agrees to execute and deliver an Agreement (Contract) in the prescribed form, and furnish the required Performance and Payment Bond, within ten (10) days after the Agreement is presented to him for signature.

It is understood by the undersigned Bidder that the Owner reserves the right to reject any or all bids.

The following provisions are also included by reference:

- Davis Bacon Act (29 CFR Part 5.5)
- EEO Compliance Reports (41 CFR Part 60-1.7)
- Trade Restriction Certification (49 CFR Part 30)
- Buy American Preferences (Title 49 United States Code, Chapter 501)
- Certification of Non-Segregated Facilities (41 CFR Part 60-1.8)
- Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion (49 CFR Part 29)

Accompanying this Proposal as bid security is a certified check/bid bond (*strike one*)

in the amount of Five percent of the greatest amount bid Dollars

($ 5% GAB), being not less than five percent (5%) of the total amount of the bid for the base bid plus additive alternate no. 1 and additive alternate no. 2, as applicable. If the undersigned Bidder is the successful Bidder, but fails or refuses to execute the contract and furnish the required bond within the prescribed ten (10) days of the notification of award, then this bid security is to become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure or refusal.

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BASE BID

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SECTION 105	MOBILIZATION	L.S.	1	285000.00 DB $ ~~220000.00~~ DB	285000.00 DB $ ~~220000.00~~ DB
	Unit price in words: Two hundred ~~twenty~~ eighty five DB thousand			dollars and 00 /100	
SS-120-1	SITE PREPARATION	L.S.	1	275000.00 $ ~~210000.00~~ DB	275000.00 $ ~~210000.00~~ DB
	Unit price in words: Two hundred ~~ten~~ seventy five DB thousand			dollars and 00 /100	
SS-300-5.1	LOCKOUT/TAGOUT AND CONSTANT CURRENT REGULATOR CALIBRATION PROCEDURES	L.S.	1	$ 2365.78	$ 2365.78
	Unit price in words: Twenty three hundred sixty five			dollars and DB ~~00~~ 78 /100	
SS-300-5.2	NON-ENCASED, SCHEDULE 80 PVC CONDUIT, 1-WAY 1"C, MOUNTED TO SURFACE FOR TEMPORARY ELECTRICAL CONNECTION	L.F.	5,000	$ 5.50	$ 27500.00
	Unit price in words: Five			dollars and 50 /100	
SS-301-5.1	EXISTING CONCRETE ENCASED, 2'Wx2'L ELECTRICAL HANDHOLE, REMOVED	EACH	1	$ 600.00	$ 600.00
	Unit price in words: Six hundred			dollars and 00 /100	
SS-301-5.2	EXISTING CONCRETE ENCASED, 3'Wx3'L FAA-STYLE ELECTRICAL HANDHOLE, REMOVED	EACH	3	$ 600.00	$ 1800.00
	Unit price in words: Six hundred			dollars and 00 /100	

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JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.3	EXISTING STAKE MOUNTED EDGE LIGHT, REMOVED	EACH	71	$ 200.00	$ 14200.00
	Unit price in words: Two hundred dollars and 00 /100				
SS-301-5.4	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED	EACH	2	$ 235.00	$ 470.00
	Unit price in words: Two hundred thirty five dollars and 00 /100				
SS-301-5.5	EXISTING BASE MOUNTED EDGE LIGHT, REMOVED, BASE TO REMAIN	EACH	1	$ 260.00	$ 260.00
	Unit price in words: Two hundred sixty dollars and 00 /100				
SS-301-5.6	ABANDONED WIND CONE BASE, REMOVED	EACH	1	$ 355.00	$ 355.00
	Unit price in words: three hundred fifty five dollars and 00 /100				
SS-301-5.7	EXISTING WIND CONE AND FOUNDATION, REMOVED	EACH	1	$ 425.00	$ 425.00
	Unit price in words: Four hundred twenty five dollars and 00 /100				
SS-301-5.8	EXISTING SEGMENTED CIRCLE MARKER SYSTEM, REMOVED	EACH	1	$ 3400.00	$ 3400.00
	Unit price in words: Thirty four hundred dollars and 00 /100				
SS-301-5.9	ABANDONED SIGN BASE, REMOVED	EACH	4	$ 300.00	$ 1200.00
	Unit price in words: Three hundred dollars and no /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-301-5.10	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED	EACH	19	$ 285.00	$ 5415.00
	Unit price in words: Two hundred eighty five dollars and 00 /100				
SS-301-5.11	EXISTING BASE MOUNTED GUIDANCE SIGN, REMOVED, BASE TO REMAIN	EACH	4	$ 280.00	$ 1120.00
	Unit price in words: Two hundred eighty dollars and 00 /100				
SS-301-5.12	CONCRETE ENCASED DUCT BANK REMOVAL	L.F.	650	$ 6.00	$ 3900.00
	Unit price in words: Six dollars and 00 /100				
SS-305-5.1	DIRECTIONAL BORING, 2-WAY 2"C POLYETHYLENE CONDUIT	L.F.	400	$ 55.00	$ 22000.00
	Unit price in words: Fifty five dollars and 00 /100				
SS-310-5.1	L-858(L) BASE MOUNTED, 2-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 5400.00	$ 21600.00
	Unit price in words: Fifty four hundred dollars and 00 /100				
SS-310-5.2	L-858(L) BASE MOUNTED, 3-MODULE GUIDANCE SIGN, INSTALLED	EACH	4	$ 7000.00	$ 28000.00
	Unit price in words: Seven thousand dollars and 00 /100				
SS-310-5.3	L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT, INSTALLED	EACH	75	$ 1150.00	$ 86250.00
	Unit price in words: Eleven hundred fifty dollars and 00 /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
SS-310-5.4	L-852T(L) LOW PROFILE BASE MOUNTED IN-PAVEMENT TAXIWAY EDGE LIGHT, INSTALLED IN EXISTING PAVEMENT	EACH	1	$ 4300.00	$ 4300.00
	Unit price in words: Forty three hundred dollars and 00 /100				
SS-310-5.5	FIELD LIGHTNING ARRESTOR, INSTALLED	EACH	5	$ 1000.00	$ 5000.00
	Unit price in words: One thousand dollars and 00 /100				
SS-310-5.6	VEHICLE SIGN ASSEMBLY, INSTALLED	L.S.	1	$ 16400.00	$ 16400.00
	Unit price in words: Sixty four hundred dollars and 00 /100				
D-701-1	18" REINFORCED CONCRETE PIPE (CLASS III)	L.F.	275	$ 88.00	$ 24200.00
	Unit price in words: Eighty eight dollars and 00 /100				
D-751-1	4'X4' SINGLE GRATE INLET (HEAVY-DUTY)	EACH	1	$ 3000.00	$ 3000.00
	Unit price in words: Three thousand dollars and 00 /100				
D-751-2	4'X4' JUNCTION BOX	EACH	1	$ 5500.00	$ 5500.00
	Unit price in words: Fifty five hundred dollars and 00 /100				
P-101-1	CONCRETE PAVEMENT REMOVAL	S.Y.	18,355	$ 15.00	$ 275325.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Fifteen		dollars and 00 /100		
P-101-2	MILLING AND REMOVAL OF ASPHALT PAVEMENT SURFACING (4" THICKNESS)	S.Y.	4,239	$ 6.75	$ 28613.25
	Unit price in words: Six		dollars and 75 /100		
P-152-1	UNCLASSIFIED EXCAVATION	C.Y.	2,250	$ 12.00	$ 27000.00
	Unit price in words: Twelve		dollars and 00 /100		
P-152-2	BORROW EXCAVATION	C.Y.	5,500	$ 16.00	$ 88000.00
	Unit price in words: Sixteen		dollars and 00 /100		
P-152-3	UNSUITABLE EXCAVATION	C.Y.	750	$ 12.50	$ 9375.00
	Unit price in words: Twelve		dollars and 50 /100		
P-154-1	8" SUBBASE COURSE	S.Y.	15,172	$ 24.50	$ 371714.00
	Unit price in words: Twenty four		dollars and 50 /100		
P-155-1	16" LIME-TREATED SUBGRADE	S.Y.	16,159	$ 8.25	$ 133311.75
	Unit price in words: Eight		dollars and 25 /100		
P-155-2	LIME	TON	600	$ 180.00	$ 108000.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Eighteen		dollars and	00 /100	
P-156-1	TEMPORARY EROSION CONTROL	L.S.	1	$ 22000.00	$ 22000.00
	Unit price in words: Twenty two thousand		dollars and	00 /100	
P-501-1	12.5" PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.	14,359	$ 90.00	$ 1292310.00
	Unit price in words: Ninety		dollars and	00 /100	
P-605-1	CONCRETE JOINT CLEAN AND SEAL	L.F.	1,500	$ 10.00	$ 15000.00
	Unit price in words: Ten		dollars and	00 /100	
P-620-1	RETRO-REFLECTIVE PAVEMENT MARKINGS	S.F.	2,650	$ 1.25	$ 3312.50
	Unit price in words: One		dollars and	25 /100	
P-620-2	NON-REFLECTIVE BLACK OUTLINE	S.F.	4,300	$ 1.25	$ 5375.00
	Unit price in words: One		dollars and	25 /100	
P-620-3	PAVEMENT MARKING REMOVAL	L.S.	1	$ 4000.00	$ 4000.00
	Unit price in words: Four thousand		dollars and	00 /100	
P-631-7.1	REFINED COAL TAR EMULSION WITH ADDITIVES FOR SLURRY COAT	S.Y.	18,637	$ 6.60	$ 123004.20

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: Six dollars and Sixty /100				
T-901-1	SEEDING, INCLUDING FERTILIZING AND WATERING	ACRE	7.4	$ 3350.00	$ 24790.00
	Unit price in words: Thirty three hundred fifty dollars and 00 /100				
T-904-1	SODDING	S.Y.	1,405	$ 4.50	$ 6322.50
	Unit price in words: Four dollars and 50 /100				
T-905-1	TOPSOILING (OBTAINED ON SITE OR REMOVED FROM STOCKPILE 2" THICKNESS)	S.Y.	36,567	$ 1.50	$ 54850.50
	Unit price in words: One dollars and 50 /100				
L-107-5.1	L-807(L), STYLE I-B, SIZE 2 WIND CONE AND FOUNDATION, IN PLACE	EACH	1	$ 10000.00	$ 10000.00
	Unit price in words: Ten thousand dollars and 00 /100				
L-107-5.2	SEGMENTED CIRCLE MARKER SYSTEM, IN PLACE	EACH	1	$ 16500.00	$ 16500.00
	Unit price in words: Sixteen thousand five hundred dollars and 00 /100				
L-108-5.1	TRENCHING FOR DIRECT-BURIED CABLE, 18 INCH MINIMUM DEPTH	L.F.	300	$ 6.40	$ 1920.00
	Unit price in words: Six dollars and 40 /100				
L-108-5.2	NO. 8 AWG, 5 kV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DUCT	L.F.	15,200	$ 2.35	$ 35720.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	BANK, OR CONDUIT				
	Unit price in words: Two dollars and 35 /100				
L-108-5.3	NO. 6 AWG, SOLID, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	6,500	$ 1.55	$ 10075.00
	Unit price in words: One dollars and 55 /100				
L-108-5.4	NO. 1/0 AWG, STRANDED, BARE COUNTERPOISE WIRE, INSTALLED IN TRENCH, ABOVE THE DUCT BANK OR CONDUIT, INCLUDING GROUND RODS AND GROUND CONNECTORS	L.F.	350	$ 3.50	$ 1225.00
	Unit price in words: Three dollars and 50 /100				
L-108-5.5	TRENCHING FOR DIRECT-BURIED BARE COUNTERPOISE WIRE, 8" MINIMUM DEPTH	L.F.	5,600	$ 3.00	$ 16800.00
	Unit price in words: Three dollars and 00 /100				
L-108-5.6	NO. 6 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2 CABLE, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	150	$ 2.00	$ 300.00
	Unit price in words: Two dollars and 00 /100				

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
L-108-5.7	NO. 8 AWG STRANDED, 600V RATED, TYPE THHN/THWN-2, GREEN INSULATED EQUIPMENT GROUND, INSTALLED IN DUCT BANK OR CONDUIT	L.F.	75	$ 1.80	$ 135.00
	Unit price in words: One dollars and 80 /100				
L-110-5.1	NON-ENCASED, ELECTRICAL CONDUIT, 1WAY-2"C	L.F.	5,600	$ 10.00	$ 56000.00
	Unit price in words: Ten dollars and 00 /100				
L-110-5.2	NON-ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	70	$ 11.30	$ 791.00
	Unit price in words: Eleven dollars and 30 /100				
L-110-5.3	NON-ENCASED, SCHEDULE 40 PVC DRAIN CONDUIT, 1-WAY 2"C	L.F.	225	$ 11.30	$ 2542.50
	Unit price in words: Eleven dollars and 30 /100				
L-110-5.4	ENCASED, ELECTRICAL CONDUIT, 1-WAY 2"C, WITH FLOWABLE FILL AND SAWCUT PAVEMENT REPAIR	L.F.	275	$ 64.00	$ 17600.00
	Unit price in words: Sixty four dollars and 00 /100				
L-110-5.5	CONCRETE ENCASED, ELECTRICAL DUCT BANK, 2-WAY 2"C	L.F.	125	$ 60.00	$ 7500.00
	Unit price in words: Sixty dollars and 00 /100				
L-110-5.6	FAA-STYLE, CONCRETE ENCASED, SPLIT DUCT CONDUIT, 1-WAY 3"C	L.F.	700	90.00	63000.00

JACK BROOKS REGIONAL AIRPORT
TAXIWAY D RECONSTRUCTION (2017) AT JACK BROOKS REGIONAL AIRPORT
BID FORM

BID ITEM	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	BID AMOUNT
	Unit price in words: ninety dollars and zero /100				
L-115-5.1	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 12" DIAMETER BY 24" DEPTH	EACH	2	$ 1000.00	$ 2000.00
	Unit price in words: one thousand dollars and zero /100				
L-115-5.2	CONCRETE ENCASED ELECTRICAL JUNCTION STRUCTURE, L-867 CLASS 1, SIZE 16" DIAMETER BY 24" DEPTH	EACH	8	$ 1150.00	$ 9200.00
	Unit price in words: eleven hundred fifty dollars and zero /100				
L-115-5.3	ADJUST MANHOLE TO NEW GRADE	EACH	1	$ 4000.00	$ 4000.00
	Unit price in words: four thousand dollars and zero /100				

3,546,872.98

TOTAL (BASE BID) $3,546,872.98

Total price in words: Three million ~~five hundred forty six~~ six hundred seventy six thousand eight hundred seventy two dollars and ninety eight /100

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It is understood the quantities of work to be done at unit prices are approximate and are intended for bidding purposes only. Amounts are to be shown in both words and figures. In case of discrepancy the amount shown in words shall govern.

Contract Award will be based on the lowest qualified bidder, depending on the availability of funds.

Bidders understand the Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to State and local laws and ordinances pertaining to the letting of construction contracts. Funding availability will be considered in selecting the bid award. The bidder agrees this bid shall be honored and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving bids.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" and to fully complete the project within:

- **359 Calendar Days** thereafter.

Bidder further agrees to pay as liquidated damages the sum of **One Thousand** Dollars **($1,000.00)** for each calendar day to complete the work beyond the allotted time or as extended by an approved Change Order or Supplemental Agreement.

Bid Affidavit

The undersigned certifies that the bid prices contained in this bid have been carefully reviewed and are submitted as correct and final. Bidder further certifies and agrees to furnish any and/or all commodities upon which prices are extended at the price offered, and upon the conditions contained in the specifications and the Notice to Bidders.

STATE OF Texas COUNTY OF Harris

BEFORE ME, the undersigned authority, a Notary Public in and for the State of Texas,

on this day personally appeared Donna Burke (name), who

after being by me duly sworn, did depose and say:

"I, Donna Burke (name) am a duly authorized officer of/agent

for Triple B Services, LLP (name of firm) and have been duly authorized to execute the

foregoing on behalf of the said Triple B Services, LLP (name of firm).

I hereby certify that the foregoing bid has not been prepared in collusion with any other bidder or other person or persons engaged in the same line of business prior to the official opening of this bid. Further, I certify that the bidder is not now, nor has been for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities bid on, or to influence any person or persons to bid or not to bid thereon."

Name and address of bidder: Triple B Services, LLP

820 Old Atascocita Rd. Huffman, Texas 77336

Fax: 281-324-3264 Telephone# 281-324-1304

by: Donna Burke (print name) Title: Senior Project Administrator

Signature: Donna Burke

SUBSCRIBED AND SWORN to before me by the above-named Donna Burke on

this the 8 day of August, 2017.

T. GALVAN
Notary Public, State of Texas
My Commission Expires
January 12, 2019

Notary Public in and for the State of Texas

Bidder Shall Return Completed Form with Offer.

SECTION D
STATEMENT OF BIDDER'S QUALIFICATIONS

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder Triple B Services, LLP.
2. Permanent main office address
   820 Old Atascocita Rd. Huffman, Texas 77336
3. When organized 1996.
4. If a corporation, where incorporated _____.
5. How many years have been engaged in the contracting business under your present firm or trade name? 21
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion)
   See attached

General character of work performed by your company

7. Have you ever failed to complete any work awarded to you? No
8. Have you ever defaulted on a Contract? No
   If so, where and why? _____
9. Have you ever been fined or had your license suspended by a Contractor's Licensing Board? No
   If so, where and why? _____
10. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed (attach to back of this document).
11. List your major equipment available for this Contract (attach to back of this document).
12. List your experience in construction work similar in scope and scale to this project (attach to back of this document).
13. Background and experience of the principal members of your organization, including the officers (attach to back of this document).
14. Credit available: $ 7,500,000.00
15. Give Bank reference: Holly Renfro @ 713-495-8059

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? Yes - Short form included in sealed envelope

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner, in verification of the recitals comprising this statement of Bidder's Qualifications.

The Bidder shall provide a brief description of any litigation or administrative proceeding of the following types, either pending or concluded within the proceeding year, to which the Bidder (and the ultimate controlling person, if different from the Bidder) or any of its directors or executive officers was a party or of which the property of any such person is or was the subject; the names of the parties and the court or agency in which such litigation or proceeding is or was pending shall be given:

(a) Administrative or judicial proceedings of any state federal agency or authority concerning environmental violations;

(b) Proceedings which may have a material effect upon the solvency of the ultimate holding company, including but not necessarily limited to, bankruptcy and receivership; and

(c) Criminal proceedings.

Dated at 820 Old Atascocita this 8 day of August, 2017.

Triple B Services, LLP
(Name of Bidder)
By Donna Burke
Title Donna Burke - Sr Project Admin

STATE OF Texas)
) §.
COUNTY OF Harris)

Donna Burke being duly sworn deposes and says that he is
Senior Project Administrator of Triple B Services, LLP
(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.
SUBSCRIBED AND SWORN TO BEFORE ME this 8 day of August, 2017.

(Notary Public)

My Commission Expires:
January 12, 2019

T. GALVAN
Notary Public, State of Texas
My Commission Expires
January 12, 2019

Bidder Shall Return Completed Statement with Offer.

CONFLICT OF INTEREST QUESTIONNAIRE

CONFLICT OF INTEREST QUESTIONNAIRE — FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY
Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

Triple B Services, LLP

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information in this section is being disclosed.**

NA
Name of Officer

This section (item 3 including subparts A, B, C, & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☑ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☑ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more?

☐ Yes ☑ No

D. Describe each employment or business and family relationship with the local government officer named in this section.

4

Signature of vendor doing business with the governmental entity

8·8·17
Date

Bidder Shall Return Completed Form with Offer.

LOCAL GOVERNMENT OFFICER
CONFLICTS DISCLOSURE STATEMENT – (OFFICE USE ONLY)

LOCAL GOVERNMENT OFFICER CONFLICTS DISCLOSURE STATEMENT

FORM CIS

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This is the notice to the appropriate local governmental entity that the following local government officer has become aware of facts that require the officer to file this statement in accordance with Chapter 176, Local Government Code.

OFFICE USE ONLY

Date Received

1 **Name of Local Government Officer**

NA

2 **Office Held**

NA

3 **Name of vendor described by Sections 176.001(7) and 176.003(a), Local Government Code**

Triple B Services, LLP

4 **Description of the nature and extent of employment or other business relationship with vendor named in item 3**

NA

5 **List gifts accepted by the local government officer and any family member, if aggregate value of the gifts accepted from vendor named in item 3 exceeds $100 during the 12-month period described by Section 176.003(a)(2)(B).**

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

Date Gift Accepted _____ Description of Gift _____

(attach additional forms as necessary)

6 **AFFIDAVIT**

I swear under penalty of perjury that the above statement is true and correct. I acknowledge that the disclosure applies to each family member (as defined by Section 176.001(2), Local Government Code) of this local government officer. I also acknowledge that this statement covers the 12-month period described by Section 176.003(a)(2)(B), Local Government Code.

Donna Burke
Signature of Local Government Officer

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said Donna Burke-Sr Project Admin, this the 8 day of August, 20 17, to certify which, witness my hand and seal of office.

Signature of officer administering oath	T Galvan Printed name of officer administering oath	Bid Coordinator Title of officer administering oath

Adopted 8/7/2015

Vendor References

Please list at least three (3) companies or governmental agencies (preferably a municipality) where the same or similar products and/or services as contained in this specification package were recently provided.

THIS FORM MUST BE RETURNED WITH YOUR BID.

REFERENCE ONE

Government/Company Name: City of Conroe

Address:

Contact Person and Title: Tommy Woolley, Projecy Engineer

Phone: 936-520-0123 Fax:

Email Address: Contract Period:

Scope of Work:

REFERENCE TWO

Government/Company Name: Harris Co Precinct 1

Address:

Contact Person and Title: Jonathan Steiber, Project Engineer

Phone: 573-673-3288 Fax:

Email Address: Contract Period:

Scope of Work:

REFERENCE THREE

Government/Company Name: City of Sugarland

Address:

Contact Person and Title: Shashi Kumar, Project Engineer

Phone: 281-275-2275 Fax:

Email Address: Contract Period:

Scope of Work: _____

Bidder Shall Return Completed Form with Offer.

SECTION E
DBE PARTICIPATION AND RESIDENCE CERTIFICATION REPORTING

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH DISADVANTAGED BUSINESS ENTERPRISES (DBE)

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Instructions for Prime Contractor/Consultant: Bidder shall submit this form with the bid; however, the information below may be submitted after contract award, but prior to beginning performance on the contract. Please submit one form for each DBE Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: Triple B Services, LLP DBE: ☐ Yes ☐ No

Address: 820 Old Atascocita Rd. Huffman, TX 77336
Street City State Zip

Phone (with area code): 281-324-3264 Fax (with area code): 281-324-1304

Project Title & No.: Jack Brooks Regional Airport - Taxiway D IFB No: 17-024/JW

Prime Contract Amount: $ 3,546,872.98

DBE Subcontractor Name: To Be Determined

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Donna Burke	Donna Burke	8-8-17
Printed Name of Contractor Representative	Signature of Representative	Date
Printed Name of DBE	Signature of Representative	Date

NOTE: NOTHING ON THIS NOTICE OF INTENT FORM IS INTENDED TO CONFER ANY RIGHTS, EXPRESSED OR IMPLIED, TO ANY THIRD PARTIES.

Pre-Approval for Subcontractor Substitutions must be obtained from the Jefferson County Purchasing Agent's Representative. The "DBE Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 1 of 4

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☒ Yes ☐ No

Prime Contractor: Triple B Services, LLP DBE: ☐ Yes ☐ No

DBE Status (Gender & Ethnicity): _____

Address: 820 Old Atascocita Rd. Huffman, TX 77336
Street City State Zip

Phone (with area code): 281-324-3264 Fax (with area code): 281-324-1304

Project Title & No.: Jack Brooks Regional Airport - Taxiway D IFB/RFP No.: 17-024/JW

Total Contract: $ 3,546,872.98 Total DBE Subcontract(s): $ TBD

Construction DBE Goals: 12.90% DBE:: To Be Determined%

FOR DBE OFFICE USE ONLY:

Verification date DBE Program Office reviewed and verified DBE Sub information Date: _____ Initials: _____

PART I. DBE SUCONTRACTOR DISCLOSURE

DBE Subcontractor Name: To Be Determined

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 2 of 4

DBE SUBCONTRACTOR DISCLOSURE

PART I: Continuation Sheet **(Duplicate as Needed)**

DBE Subcontractor Name: To Be Determined

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

DBE Subcontractor Name: _____

DBE Status (Gender & Ethnicity): _____

Certifying Agency: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

All DBE Subcontractor Participation may be verified with the DBE Subcontractor(s) listed on Part I.

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 3 of 4

PART II: STATEMENT OF NON-COMPLIANCE FOR NOT MEETING DBE SUBCONTRACTING GOALS

Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

Our firm was unable to meet the DBE goals for this project for the following reasons:

- ☐ All subcontractors to be utilized are "Non-DBEs." *(Complete Part III)*
- ☐ DBEs were solicited but did not respond.
- ☐ DBEs solicited were not competitive.
- ☐ DBEs were unavailable for the following trade(s):
- ☑ Other: Working to utilize DBE Subcontractors - To Be Determined

Was the Jefferson County DBE Office contacted for assistance in locating DBEs? ☐ Yes ☐ No

PART III: DISCLOSURE OF OTHER "NON-DBE" SUBCONTRACTS

The bidder shall use this area to provide a listing of all "Non-DBE" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-DBE" Subcontractors the bidder selects, after bid submission, shall be provided to the Purchasing Office not later than five (5) calendar days after being notified that bidder is the apparent low bidder. A list of those "Non-DBE" Subcontractors that are selected after contract award must be provided **immediately** after their selection.

Subcontractor Name: To Be Determined

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $ _____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Bidder Shall Return Completed Form with Offer.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)
SUBCONTRACTING PARTICIPATION DECLARATION FORM
Page 4 of 4

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

Subcontractor Name: _____

Address: _____
Street City State Zip

Contact person: _____ Title: _____

Phone (with area code): _____ Fax (with area code): _____

Proposed Subcontract Amount: $_____ Percentage of Prime Contract: _____ %

Description of Subcontract Work to be Performed: _____

I hereby certify that I have read the *DBE Program Instructions and Information*, truthfully completed all applicable parts of this form, and **attached any necessary support documentation as required.** I fully understand that intentionally falsifying information on this document may result in my not receiving a contract award or termination of any resulting contract.

Name (print or type): Donna Burke

Title: Senior Project Administrator

Signature: Donna Burke

Date: August 8, 2017

E-mail address: donna@triplebservices.com

Contact person that will be in charge of invoicing for this project:

Name (print or type): Donna Burke

Title: Senior Project Administrator

Date: August 8, 2017

E-mail address: donna@triplebservices.com

Bidder Shall Return Completed Form with Offer.

GOOD FAITH EFFORT (GFE) DETERMINATION CHECKLIST

This information must be submitted with your bid.

Bidder intends to utilize subcontractors/subconsultants in the fulfillment of this contract (if awarded).
☑ Yes ☐ No

Instructions: In order to determine if a "Good Faith Effort" was made in soliciting DBEs for subcontracting opportunities, the following checklist and supporting documentation shall be completed by the Prime Contractor/Consultant, and returned with the Prime Contractor/ Consultant's bid. This list contains the **minimum** efforts that should be put forth by the Prime Contractor/Consultant when attempting to achieve or exceed the goals of DBE Subcontractor participation. The Prime Contractor/Consultant may extend his/her efforts in soliciting DBE Subcontractor participation beyond what is listed below.

Did the Prime Contractor . . .

☑ Yes	☐ No	1. To the extent practical, and consistent with standard and prudent industry standards, divide the contract work into the smallest feasible portions, to allow for maximum DBE Subcontractor participation?
☑ Yes	☐ No	2. **Notify** in writing a reasonable number of DBEs, allowing sufficient time for effective participation of the planned work to be subcontracted?
☑ Yes	☐ No	3. **Provide** DBEs that were genuinely interested in bidding on a subcontractor, adequate information regarding the project (i.e., plans, specifications, scope of work, bonding and insurance requirements, and a point of contract within the Prime Contractor/Consultant's organization)?
☑ Yes	☐ No	4. **Negotiate** in good faith with interested DBEs, and not reject bids from DBEs that qualify as lowest and responsive bidders?
☑ Yes	☐ No	5. **Document** reasons DBEs were rejected? Was a written rejection notice, including the reason for rejection, provided to the rejected DBEs?
☐ Yes	☐ No	6. If Prime Contractor/Consultant has zero (0) DBE participation, **please explain the reasons why.**

If "No" was selected, please explain and include any pertinent documentation with your bid.
If necessary, please use a separate sheet to answer the above questions.

Donna Burke
Printed Name of Authorized Representative

Donna Burke
Signature

Senior Project Administrator
Title

August 8, 2017
Date

Bidder Shall Return Completed Form with Offer.

RESIDENCE CERTIFICATION/TAX FORM

Pursuant to Texas Government Code §2252.001 *et seq.*, as amended, Jefferson County requests Resident Certification. §2252.001 *et seq.* of the Government Code provides some restrictions on the awarding of governmental contracts; pertinent provisions of §2252.001 are stated below:

(3) "Nonresident bidder" refers to a person who is not a resident.

(4) "Resident bidder" refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

☒ I certify that Triple B Services, LLP [company name] is a Resident Bidder of Texas as defined in Government Code §2252.001.

☐ I certify that _____ [company name] is a Nonresident Bidder as defined in Government Code §2252.001 and our principal place of business is _____ _____ (city and state).

Taxpayer Identification Number (T.I.N.):	76-0507104
Company Name submitting bid/proposal:	Triple B Services, LLP
Mailing address:	820 Old Atascocita Rd. Huffman, Texas 77336
If you are an individual, list the names and addresses of any partnership of which you are a general partner:	

Property: List all taxable property owned by you or above partnerships in Jefferson County.

Jefferson County Tax Acct. No.*	Property address or location**
NA	

* This is the property amount identification number assigned by the Jefferson County Appraisal District.

** For real property, specify the property address or legal description. For business property, specify the address where the property is located. For example, office equipment will normally be at your office, but inventory may be stored as a warehouse or other location.

Bidder Shall Return Completed Form with Offer.

SECTION F
BID SURETY

Liberty Mutual.

Interchange Corporate Center
450 Plymouth Road, Suite 400
Plymouth Meeting, PA. 19462-1644
Ph. (610) 832-8240

BID BOND

Bond Number: N/A

KNOW ALL MEN BY THESE PRESENTS, that we
TRIPLE B SERVICES, LLP

, as principal (the "Principal"), and LIBERTY MUTUAL INSURANCE COMPANY, a Massachusetts stock insurance company, as surety (the "Surety"), are held and firmly bound unto
JEFFERSON COUNTY PURCHASING

, as obligee (the "Obligee"), in the penal sum of
FIVE PERCENT OF THE GREATEST AMOUNT BID

Dollars ($ 5% GAB), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for:
TAXIWAY D RECONSTRUCTION

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal within the period specified therein, or, if no period be specified, within sixty (60) days after opening, and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or contract documents, or in the event of the failure of the Principal to enter into such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference in money not to exceed the penal sum hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void; otherwise to remain in full force and effect. In no event shall the liability hereunder exceed the penal sum hereof.

PROVIDED AND SUBJECT TO THE CONDITION PRECEDENT, that any claim by Obligee under this bond must be submitted in writing by registered mail, to the attention of the Surety Law Department at the address above, within 120 days of the date of this bond. Any suit under this bond must be instituted before the expiration of one (1) year from the date of this bond. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall apply.

DATED as of this 7TH day of AUGUST, 2017.

WITNESS / ATTEST:

TRIPLE B SERVICES, LLP

(Principal)

By: Donna Burke (Seal)
Name: Donna Burke
Title: Sr Project Admin.

LIBERTY MUTUAL INSURANCE COMPANY
(Surety)

By: (Seal)
LAUREN . MOUDY Attorney-In-Fact

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND. 1939

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7741812

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Carol E. Hock; Lauren O. Moudy; Robert M. Overbey, Jr.; Suzonne D. Lawrence

all of the city of Houston, state of TX each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 24th day of April, 2017.

The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 24th day of April, 2017, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 7th day of August, 20 17.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

LMS_12873_022017

Liberty Mutual.
SURETY

TEXAS
IMPORTANT NOTICE

To obtain information or make a complaint:

You may call toll-free for information or to make a complaint at
1-877-751-2640

You may also write to:

2200 Renaissance Blvd., Ste. 400
King of Prussia, PA 19406-2755

You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights or complaints at
1-800-252-3439

You may write the Texas Department of Insurance
Consumer Protection (111-1A)
P. O. Box 149091
Austin, TX 78714-9091
FAX: (512) 490-1007
Web: http://www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

PREMIUM OR CLAIM DISPUTES:

Should you have a dispute concerning your premium or about a claim you should first contact the agent or call 1-800-843-6446. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR POLICY:

This notice is for information only and does not become a part or condition of the attached document.

TEXAS
AVISO IMPORTANTE

Para obtener informacion o para someter una queja:

Usted puede llamar al numero de telefono gratis para informacion o para someter una queja al
1-877-751-2640

Usted tambien puede escribir a:

2200 Renaissance Blvd., Ste. 400
King of Prussia, PA 19406-2755

Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de companias, coberturas, derechos o quejas al
1-800-252-3439

Puede escribir al Departamento de Seguros
de Texas Consumer Protection (111-1A)
P. O. Box 149091
Austin, TX 78714-9091
FAX # (512) 490-1007
Web: http://www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

DISPUTAS SOBRE PRIMAS O RECLAMOS:

Si tiena una disputa concerniente a su prima o a un reclamo, debe comunicarse con el agente o primero. Si no se resuelve la disputa, puede entonces comunicarse con el departamento (TDI)

UNA ESTE AVISO A SU POLIZA:

Este aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY
CERTIFICATION OF FILING

Certificate Number:
2017-246488

Date Filed:
08/08/2017

Date Acknowledged:

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.
Triple B Services, LLP
Huffman, TX United States

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.
Jefferson County

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.
17-024/JW
Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

4 Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
		Controlling	Intermediary
Burke, Charles	Huffman, TX United States	X	
Burke, Keith	Huffman, TX United States	X	
Burke, Kevin	Huffman, TX United States	X	

5 Check only if there is NO Interested Party. ☐

6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

T. GALVAN
Notary Public, State of Texas
My Commission Expires
January 12, 2019

Donna Burke
Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said Donna Burke - Sr Project Admin, this the 8 day of August, 20 17, to certify which, witness my hand and seal of office.

Signature of officer administering oath	Printed name of officer administering oath	Title of officer administering oath
	T Galvan	Bid Coordinator

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT

1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	1
Issued (Date):	July 25, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Rescheduled Walk-Throughs & Cut-off Date for Responses to Question Submissions

- **Property Walk-Throughs**

Please note that the original walk-through scheduled for Tuesday, July 25, 2017 *has been rescheduled.* Bidders will now have (2) opportunities to walk-through the airport property and view secured areas of the project, as follows:

Thursday, July 27, 2017 – 10:00 am CDT
Thursday, July 27, 2017 – 1:00 pm CDT

Bidders are to meet at the Jack Brooks Regional Airport, Administration Office (Lobby), 5000 Jerry Ware Blvd., Beaumont, Texas 77705.

This will be the bidder's only opportunity to walk-through the property and view secured areas of the project.

- **Cut-off Date for Responses to Question Submissions**

Bidders must submit technical questions via email to Colin Bible, Project Manager with Garver, LLC. at CMBible@GarverUSA.com **by 5:00 pm CDT, Tuesday, August 1, 2017** in order to receive a response.

Addendum No. 1 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)

Donna Burke - Senior Project Administrator
Title of Person Signing Above

Triple B Services, LLP
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number: IFB 17-024/JW

IFB Title: Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

IFB Due: **11:00 am CDT, Tuesday, August 8, 2017**

Addendum No.: 2

Issued (Date): August 2, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Updating DBE Goals, Documenting Pre-Bid Meeting, and Updating existing electrical structure final grades.

- **Updating DBE Goals**

Please find attached the updated DBE Participation Forms. This reflects the new DBE Goals to be met.

- **Documenting Pre-Bid Meeting**

Please find attached the Pre-Bid meeting Agenda and the Pre-Bid meeting sign-in sheet.

- **Updating electrical structure final grades**

Please find attached the electrical drawings for the elevation adjustment of the electrical hand hole. This additional work warranted an update in the L-115 technical specification and pay item (L-115-5.3). The new L-115 specification is attached to this addendum along with the bid form featuring the updated pay item. Furthermore, the FAA-C-1391d specification governing the aforementioned adjustment has been added and so is the updated list of technical specifications.

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)

Donna Burke - Senior Project Administrator
Title of Person Signing Above

Triple B Services, LLP
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

JEFFERSON COUNTY, TEXAS
PURCHASING DEPARTMENT
1149 Pearl Street – First Floor
Beaumont, Texas 77701
409-835-8593 phone

ADDENDUM TO IFB

IFB Number:	IFB 17-024/JW
IFB Title:	Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
IFB Due:	**11:00 am CDT, Tuesday, August 8, 2017**
Addendum No.:	3
Issued (Date):	August 4, 2017

TO BIDDER: This Addendum is an integral part of the IFB package under consideration by you as a Bidder in connection with the subject matter herein identified. Jefferson County deems all sealed proposals to have been proffered in recognition and consideration of the entire IFB package – **including all addenda.** For purposes of clarification, **receipt of this present Addendum by a Bidder should be evidenced by returning it (signed) as part of the Bidder's sealed proposal.** If the Proposal has already been received by the Jefferson County Purchasing Department, Bidder should return this addendum in a separate sealed envelope, clearly marked with the IFB Title, IFB Number, and Opening Date and Time, as stated above.

Reason for Issuance of this Addendum: Extending the Construction Schedule, and Changing the Method of Measurement for P-152 Material.

- **Extending the Construction Schedule**

The construction schedule has been extended from 274 calendar days to 359 calendar days. Please find attached the updated Construction Safety and Phasing sheets from the construction drawings reflecting the new phase durations. The project manual has also been edited to reflect the new schedule. The following project manual sections reference the construction duration and have therefore been updated and included in this addendum: The Template Notice to Proceed; The Bid Form; The Contract.

- **Changing the Method of Measurement for P-152 Material**

Borrow material – governed by the P-152 specification – shall no longer be measured for payment in its original position at the borrow pit. Instead, it shall be paid for based on plan quantities as stated in the amended and attached P-152 specification.

Addendum No. 3 (Continued)
(IFB 17-024/JW), Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport

The information included herein is hereby incorporated into the documents of this present Bid matter and supersedes any conflicting documents or portion thereof previously issued.

Receipt of this Addendum is hereby acknowledged by the undersigned Bidder:

ATTEST:

Witness

Witness

Approved by ____ Date: _____

Authorized Signature (Bidder)

Donna Burke
Title of Person Signing Above

Senior Project Administrator
Typed Name of Business or Individual

820 Old Atascocita Rd. Huffman, TX 77336
Address

TRIPLE B SERVICES, L.L.P.
820 OLD ATASCOCITA ROAD
HUFFMAN, TX 77336

Bid Submitted for:

Taxiway D Reconstruction (2017) at Jack Brooks Regional Airport
Bid No: IFB 17-024/JW

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, Texas 77701

August 8, 2017 11:00 AM

RECEIVED 10:51 AM AUG 08 2017

Attachment A

IFB 16-019/YS
Term Contract for Sheriff's Department (Jefferson County)
Law Enforcement Equipment and Uniforms
Awarded August 22, 2016

Item	Description	Vendor	Price Ea.	Proposed Price
1.	Male Prestige Advance Trouser (Elbeco E494RN)	~~Texas Code Blue~~ GT Distributors	~~68.00~~ 68.59	
2.	Male Prestige Advance LS Shirt (Elbeco 840N)	Galls, LLC	57.00	58.48
3.	Male Prestige Advance SS Shirt (Elbeco 8440N)	Galls, LLC	52.00	53.34
4.	Female Prestige Advance LS Shirt (Elbeco 9340LCN)	Galls, LLC	57.00	58.48
5.	Female Prestige Advance SS Shirt (Elbeco 9840LCN)	Galls, LLC	52.00	53.34
6.	Female Prestige Advance Trouser (Elbeco 9494LCN)	~~Texas Code Blue~~ GT Distributors	~~68.00~~ 68.29	
7.	Elbeco Tex-Trop w/ zip – F – LS (Elbeco 9314LCN)	Galls, LLC	36.50	
8.	Elbeco Tex-Trop w/ zip – F – SS (Elbeco Z9814LCN)	Galls, LLC	33.50	
9.	Elbeco Tex-Trop w/ zip – M – LS (Elbeco Z314N)	Galls,LLC	36.50	
10.	Elbeco Tex-Trop w/ zip – M – SS (Elbeco Z3314N)	Galls, LLC	33.50	
11.	Male Tex-Trop Trouser (Elbeco E314RN)	Galls, LLC	41.95	
12.	Elbeco Tex-Trop – F – LS (Elbeco 9314LCN)	Galls, LLC	34.00	
13.	Elbeco Tex-Trop – F – SS (Elbeco 9814LCN)	Galls, LLC	31.00	31.75
14.	Elbeco Tex-Trop – M – LS (Elbeco 314N)	Galls, LLC	34.00	34.85
15.	Elbeco Tex-Trop – M – SS (Elbeco 3314N)	Galls, LLC	31.00	
16.	Female Tex-Trop Trouser (Elbeco E9314LC)	Galls, LLC	41.95	
17.	Jacket (Elbeco 3800)	No bid		
18.	Polo Shirt (Cornerstone CS410)	Galls, LLC	30.95	
19.	Horace Small Sentry Windbreaker (Liberty 560MBK)	Galls, LLC	19.90	
20.	Name Badge (Blackinton J2)	GT Distributors	10.95	
21	Raincoat (Neese Industries #447RSC3M))	GT Distributors	63.48	

Attachment A

.			
22.	Belt (Safariland 87)	GT Distributors	48.25 Additional cost for size 46 & up
23.	Belt (Safariland 99)	GT Distributors	25.15 Additional cost for size 46 & up
24.	Belt (5.11 TACTICAL 59501 – Burgoon Company, ~~Perfect Fit PF-5000 – Texas Code Blue~~)	Burgoon Company ~~Texas Code Blue~~	30.00
25.	Cuff Case (Safariland SAF-190-2B)	GT Distributors	24.13
26.	Cuff Case (Safariland SAF-090-1-16)	GT Distributors	18.71
27.	Baton Holder (G&G B560)	10-32 Supply	15.00
28.	Holster Level III (Safariland 6360)	Burgoon Company	139.00
29.	Holster Level III (Safariland SAF-070-83-161))	GT Distributors	131.87
30.	Double Magazine Holder (Safariland SAF-77-83-2PBL)	GT Distributors	26.48
31.	Double Magazine Holder (Safariland SAF-75-83-2)	GT Distributors	20.47
32.	OC Spray Holder (Safariland SAF-38-4-2B)	GT Distributors	20.47
33.	Belt Keepers (Safariland SAF-63-2B)	GT Distributors	4.54
34.	S.O. Lapel Pin (Blackinton BL-J110)	GT Distributors	4.72
35.	Traffic Vest (Vizguard S912)	Galls, LLC	36.01
36.	Handcuffs, Nickel (Peerless M901P)	ICS Jail Supplies, Inc.	19.50
37.	Red Cone Stinger (STL-75903)	GT Distributors	3.76
38.	Red Cone SL20 (STL-22511)	GT Distributors	4.29
39.	Stinger Flashlight (Streamlight 75014)	Burgoon Company	110.00
40.	Stinger Flashlight Battery (STL-75175)	GT Distributors	12.70
41.	Stinger Flashlight Bulb (STL-75914)	GT Distributors	5.52

Attachment A

42.	Stinger Flashlight Lens Kit (Streamlight 75956)	Burgoon Company	26.20
43.	Stinger DS LED – aluminum (STL-75866)	GT Distributors	87.24
44.	Stinger DS LED – polymer (STL-76113	GT Distributors	91.84
45.	SC20XP LED Flashlight – alum. (Streamlight 25103)	Burgoon Company	94.57
46.	SC20XP LED Flashlight – nylon (STL-25103)	GT Distributors	87.17
47.	Maglite Flashlight (Maglite RL 1019)	Galls, LLC	98.00
48.	Maglite Flashlight Battery (Maglite ARX235)	Galls, LLC	29.05
49.	Maglite Flashlight Bulb (Maglite LR00001)	Galls, LLC	5.00
50.	ASP Baton, Black (ASP-52611)	GT Distributors	76.67
51.	Kevlar Gloves ~~(Strong Suit Enforcer)~~ (DAM-DMZ33-B)	~~Texas Code Blue~~ GT Distributors	32.00
52.	Leg Irons, Standard (Peerless M902)	ICS Jail Supplies, Inc.	33.75
53.	Molded One-Piece Seat Org. (GT-BR-017)	GT Distributors	30.65
54.	Additional Items (% off)	~~Texas Code Blue~~ GT Distributors	~~28%~~ 15% GT Catalog or website
55.	Ballistic Vests (% off) (Point Black Alpha Elite 3A)	Galls, LLC	45%

Attachment A

Vendor shall comply with 15-day delivery whenever possible and shall notify the department in the event that the order will take longer.

10-32 Supply
1048 Neches Street
Beaumont TX 77701
Attn: Bobby F. Goza
Phone: 409-832-4475
Fax: 409-832-4481
bfg1032@hotmail.com

Burgoon Company
2727 Broadway
Galveston TX 77550
Attn: Donna Hanson
Phone: 800-287-4666
Fax: 800-724-0267
dhanson@burgooncompany.com

GT Distributors, Inc.
2545 Brockton Drive, Suite 100
Austin TX 78758
Attn: Jamy Copeland
Phone: 800-252-8310
Fax: 800-480-5845
txbids@gtdist.com

Galls, LLC
1340 Russell Cave Road
Lexington KY 40505
Attn: Rob Hauswald
Phone: 800-876-4242
Fax: 859-266-7227
hauswald-rob@galls.com

ICS Jail Supplies, Inc.
PO Box 21056
Waco TX 76702
Attn: Maegan Eisenman
Phone: 254-751-1566
Fax: 254-751-0299
bids@icswaco.com

Galls | Quartermaster
1340 Russell Cave Road
Lexington, KY 40505
859-266-7227

July 13, 2017

Attn: Deborah L. Clark
Jefferson County Purchasing
1149 Pearl St., 1st Floor
Beaumont, TX 77701

RE: Contract #IFB 16-019/YS - Request for Renewal/Price Increase

Dear Deborah:

Galls, LLC ("Galls") will be happy to renew contract # IFB 16-019/YS (the "Contract") however due to increased costs from our suppliers and changes to market conditions affecting labor, utility, and shipping costs, Galls, LLC ("Galls") is requesting a 2.5% price increase on some of the goods and services provided by Galls on the Contract.

As evidence of the above and for your records, please find enclosed documentation supporting this request. Also enclosed is an updated pricing schedule detailing the increase.

This request is in accordance with the Contract and if approved will take effect on the effective date of the renewal term.

Please direct all questions to the undersigned.

We appreciate your attention to this important matter.

Regards,

R. Michael Andrews Jr.
CFO
Galls, LLC

Enclosure: Documented Increases from Blackinton and Elbeco
Updated Pricing for the impacted items.

1954

GALLS®
The Authority in Public Safety Equipment and Apparel

LONE STAR UNIFORMS
A GALLS® LLC COMPANY

Price Quote

Rob Hauswald/David Mitrani
Galls, LLC
1340 Russell Cave Road
Lexington, KY 40505
800-876-4242 phone
877-914-2557 fax

Attention:

Account Number	0
Name	Jefferson Cnty Sheriff
Street Address	
City & State	

Quote Date *7/13/2017*

Jefferson County Sheriff- IFB 16-019/YS- Renewal Pricing

		Item #	Model#	Description	Qty	Retail	Curent Price	Renewal Price
1		SG908 NAV	Elbeco 840N	DISTINCTION MENS L/S SHIRT	1	$76.99	$57.00	$58.48
2		SG909 NAV	Elbeco 8440N	DISTINCTION MENS S/S SHIRT	1	$69.99	$52.00	$53.34
3		SG916 NAV	Elbeco 9340LCN	DISTINCTION LADIES L/S SHIRT	1	$76.99	$57.00	$58.48
4		SG917 NAV	Elbeco 9840LCN	DISTINCTION LADIES S/S SHIRT	1	$69.99	$52.00	$53.34
5		SH856 MDNV	Elbeco 9814LCN	TEXTROP2 FEMALE SS SHIRT	1	$46.99	$31.00	$31.75
6		SH874 MDNV	Elbeco 314N	TEX TROP2 MENS LS SHIRT	1	$52.99	$34.00	$34.85
7		ZH384D	Blackinton J2	J SERIES NAME BAR	1	$13.00	$10.95	$11.19

V. H. Blackinton & CO., INC.
221 JOHN DIETSCH BLVD.
P. O. BOX 1300
ATTLEBORO FALLS, MA 02763-0300
508 699-4436
FAX: 508 695-5349
badges@blackinton.com

January 17, 2017

Galls, Inc.
1340 Russell Cave Road
Lexington, KY 40505-3114

Re: Price Increases since 2015

To whom it may concern:

This letter is to confirm that V.H. Blackinton & Co., Inc. implemented an approximate price increase of 1.5 percent which took effect January 1, 2015 from the previous year.

The following two years we implemented another approximate increase of 2.5 percent (each year) from the prior years.

Please let us know if we can be of further assistance to you.

Best Regards,
V.H. BLACKINTON & CO., INC.

Stacy Rochefort
Galls Account Manager
International and Domestic
Sales Support Manager

Phone: 508-699-4436 ext. 149
Fax: 508-695-5349
E-mail: stacy@blackinton.com
www.blackinton.com

Professional
Performance
Uniforms

June 28, 2017

Jefferson County
Attn: Deborah Clark-Purchasing Agent
1149 Pearl Street, First Floor
Beaumont, TX 77701

To whom it may concern:

In regards to style numbers 840N/9340LCN/8840N/9840LCN/314N and 9314LCN on the contract we have with Galls, there has been a total of a 2.5% increase for each style from August 2016 through present. These increases were due to the higher costs of material, trim and labor.

Thank you for your valued business.

Sincerely,

Samantha Ludwig
Contract Coordinator

CONTRACT RENEWAL FOR IFB 16-019/YS
TERM CONTRACT FOR SHERIFF'S DEPARTMENT (JEFFERSON COUNTY) UNIFORMS & EQUIPMENT

The County entered into a contract with Burgoon Company for one (1) year, from August 22, 2016 to August 21, 2017, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its first one-year option to renew the contract for one (1) additional year from August 21, 2017 to August 20, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

COMMISSIONERS COURT JEFFERSON COUNTY, TEXAS

CONTRACTOR:
Burgoon Company

Donna Hanson
(Name)

CONTRACT RENEWAL FOR IFB 16-019/YS
TERM CONTRACT FOR SHERIFF'S DEPARTMENT (JEFFERSON COUNTY) UNIFORMS & EQUIPMENT

The County entered into a contract with GT Distributors, Inc. for one (1) year, from August 22, 2016 to August 21, 2017, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its first one-year option to renew the contract for one (1) additional year from August 21, 2017 to August 20, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

CONTRACTOR:
GT Distributors

David Curtis, Bids Manager

CONTRACT RENEWAL FOR IFB 16-019/YS TERM CONTRACT FOR SHERIFF'S DEPARTMENT (JEFFERSON COUNTY) UNIFORMS & EQUIPMENT

The County entered into a contract with Galls, LLC for one (1) year, from August 22, 2016 to August 21, 2017, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its first one-year option to renew the contract for one (1) additional year from August 21, 2017 to August 20, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

COMMISSIONERS COURT JEFFERSON COUNTY, TEXAS

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

CONTRACTOR:
Galls, LLC

(Name)

CONTRACT RENEWAL FOR IFB 16-019/YS
TERM CONTRACT FOR SHERIFF'S DEPARTMENT (JEFFERSON COUNTY) UNIFORMS & EQUIPMENT

The County entered into a contract with ICS Jail Supplies, Inc. for one (1) year, from August 22, 2016 to August 21, 2017, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its first one-year option to renew the contract for one (1) additional year from August 21, 2017 to August 20, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

COMMISSIONERS COURT JEFFERSON COUNTY, TEXAS

CONTRACTOR:
ICS Jail Supplies, Inc.

(Name)

ATTACHMENT B

IFB 13-016/JW,
Term Contract for Disaster and Emergency Repair, Service, and Installation of Electrical Services for Jefferson County

		Ledet	Gold Crest	Gold Crest PROPOSED
Item No.	**Description**	**Per Labor Hour ($)**	**Per Labor Hour ($)**	**Per Labor Hour ($)**
1	One electrician during working hours (M-F, 7:30am to 5:00pm)	55.00	~~65.00~~	85.00
2	One apprentice electrician accompanying an electrician during working hours (M-F, 7:30am to 5:00pm)	39.00	~~42.00~~	61.00
3	One apprentice electrician for emergency service on weekdays and Saturdays (5:00pm to 7:30am M-F; all day Saturday)	65.00	~~85.00~~	115.00
4	One apprentice electrician accompanying an electrician on weekdays and Saturdays (5:00pm to 7:30am M-F; all day Saturday)	44.00	~~60.00~~	92.00
5	One electrician for emergency service on Sundays and Holidays	100.00	~~102.00~~	146.00
6	One apprentice electrician accompanying an electrician for emergency service on Sundays and Holidays	65.00	~~72.00~~	122.00
7	One electrician for emergency service with disaster relief during mandatory/voluntary county evacuation (M-F, 7:30 am to 5:00 pm)	75.00	~~75.00~~	95.00
8	One electrician for emergency service with disaster relief during mandatory/voluntary county evacuation (5:00pm to 7:30am M-F; all day Saturday).	85.00	~~95.00~~	125.00
9	One electrician for emergency service with disaster relief during mandatory/voluntary county on Sundays and Holidays	100.00	~~120.00~~	164.00
10	One apprentice electrician accompanying an electrician for emergency service with disaster relief during mandatory/voluntary county evacuation (M-F, 7:30am-5:00pm)	65.00	~~55.00~~	74.00
11	One apprentice electrician accompanying an electrician for emergency service with disaster relief during mandatory/voluntary county evacuation (5:00pm-7:30am M-F; all day Saturday)	70.00	~~75.00~~	107.00
12	One apprentice electrician accompanying an electrician for emergency service with disaster relief during mandatory/voluntary county evacuation Sundays & Holidays.	70.00	~~90.00~~	140.00

ATTACHMENT B (Continued)

IFB 13-016/JW,
Term Contract for Disaster and Emergency Repair, Service, and Installation of Electrical Services for Jefferson County

Item No.	Description	Ledet	Gold Crest	Gold Crest PROPOSED
		Hourly Rate	**Hourly Rate**	**Hourly Rate**
13	Hourly rates for hydraulic lifts	Rental + 15%	50.00	50.00
14	Hourly rates for winch trucks	Rental + 15%	50.00	50.00
15	Hourly rates for pole line trucks	Rental + 15%	50.00	50.00
		% Markup	**% Markup**	**% Markup**
16	Materials, supplies, and/or equipment furnished by contractor shall be billed at cost plus ____% markup. Jefferson County reserves the right to request copies of invoices made to contractor from supplier including freight charges.	15%	~~15%~~	25%
17	Rental equipment furnished by contractor, with prior approval of the County, to be billed at cost plus ____% markup	15%	10%	10%
		Fee per $100 value	**Fee per $100 value**	**Fee per $100 value**
18	Contract fee for permitting: $____ per $100 value.	10.00	n/a	n/a
		Per Labor Hour ($)	**Per Labor Hour ($)**	**Per Labor Hour ($)**
19	Supply qualified electrician to assist Jefferson County personnel. $_____	55.00	~~65.00~~	85.00

Ledet Electrical Svc.
5371 Ada Ave.
Beaumont, TX 77708
Attn: Joseph L. Ledet III
Ph: 409-896-5471/409-835-1040/409-794-1366
Fax: 409-896-5471
Jledet3@netzero.com

Gold Crest Electrical Company, Inc.
1655 S. 23rd Street
Beaumont, Texas 77706
Attn: Robert Ramer
Ph: 409-842-4652
Fax: 409-842-6590

Gold Crest ELECTRIC COMPANY, INC.
ELECTRICAL CONTRACTORS

Phone (409) 842-4652
Fax: (409) 842-[redacted]6590

1655 South 23rd Street
Beaumont, Texas 77707-4303

August 4, 2017

Jefferson County Purchasing Department
1149 Pearl Street, 1st Floor
Beaumont, TX 77701

Re: (IFB 13-016/JW), Term Contract for Disaster and Emergency Repair, Service, and Installation of Electrical Services for Jefferson County

Dear Ms. Clark, Purchaser:

We received the renewal papers for the above contract. At this time, we would like to submit our request for an increase in the original rates we were awarded. The original contract was signed in 2013, and we have held those prices at that rate for the previous renewals. However, the costs of labor and insurance have risen to a point that the 2013 rates are no longer profitable, and we are requesting new rates per the attached sheet.

We appreciate your consideration in granting this request and we look forward to continuing to serve your electrical needs.

Sincerely,
GOLD CREST ELECTRIC COMPANY, INC.

Robert Ramer, Jr.
Estimator

RR:mm
Enc.

CONTRACT RENEWAL FOR IFB 13-016/JW
TERM CONTRACT FOR DISASTER AND EMERGENCY REPAIR, SERVICE, AND INSTALLATION OF ELECTRICAL SERVICES FOR JEFFERSON COUNTY

The County entered into a contract with Gold Crest Electrical Company, Inc. for one (1) year, from September 9, 2013 to September 8, 2014, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its fourth one-year option to renew the contract for one (1) additional year from September 5, 2017 to September 4, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

CONTRACTOR:
Gold Crest Electrical Company, Inc.

(Name) ROBERT RAMER, JR.

CONTRACT RENEWAL FOR IFB 13-016/JW
TERM CONTRACT FOR DISASTER AND EMERGENCY REPAIR, SERVICE, AND INSTALLATION OF ELECTRICAL SERVICES FOR JEFFERSON COUNTY

The County entered into a contract with Ledet Electrical Services for one (1) year, from September 9, 2013 to September 8, 2014, with an option to renew the contract for up to a five (5) year period.

Pursuant to the contract, Jefferson County hereby exercises its fourth one-year option to renew the contract for one (1) additional year from September 5, 2017 to September 4, 2018.

ATTEST:

Carolyn L. Guidry, County Clerk

COMMISSIONERS COURT JEFFERSON COUNTY, TEXAS

JEFFERSON COUNTY, TEXAS

Jeff Branick, County Judge

CONTRACTOR:
Ledet Electrical Services

(Name) Joseph Ledet III

JEFFERSON COUNTY PURCHASING DEPARTMENT
Deborah Clark, Purchasing Agent

1149 Pearl Street, First Floor, Beaumont, TX 77701 409-835-8593 Fax 409-835-8456

AMENDMENT VI TO CONTRACT

August 8, 2017

Republic Services of Beaumont
6425 Highway 347
Beaumont TX 77705
Attention: Mr. Bill Voigtman

Dear Mr. Voigtman:

This letter will serve as Amendment VI (six) to contract IFB 15-011/JW, Term Contract for Trash and Biomedical Waste Container Service for Jefferson County.

Amendment VI (6) will add Standard Waste Containers (10 cubic yards & under) service for Jefferson County Road & Bridge, Precinct 3, Stockpile, 24420 Highway 124, Beaumont TX, 77705, one (1) four (4) cubic yard waste container to be serviced one (1) time per week for $45.00 per month.

Please sign below, and return to me via fax (409) 835-8456 or email (ysauer@co.jefferson.tx.us).

Bill Voigtman
Republic Services of Beaumont

8/9/17
Date

Jeff R. Branick
Jefferson County Judge

8/14/2017
Date

ATTEST _____
DATE 8/14/17

COMMISSIONERS COURT
JEFFERSON COUNTY, TEXAS

JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah Clark, Purchasing Agent

1149 Pearl Street, Beaumont, TX 77701 Phone: 409-835-8593 Fax: 409-835-8456

MEMORANDUM

To: Commissioners' Court

From: Deborah Clark
Purchasing Agent

Date: August 8, 2017

Re: Transfer of Vehicle

Consider and possibly approve transfer of (1) vehicle from Port Arthur Independent School District to A.S.A.P. Program. The district has authorized (1) vehicle: 2017 Ford Explorer VIN 1FM5K8AR1HGB93852.

Thank you.

JEFFERSON COUNTY PURCHASING DEPARTMENT
Deborah Clark, Purchasing Agent

1149 Pearl Street, Beaumont, TX 77701 Phone: 409-835-8593 Fax: 409-835-8456

MEMORANDUM

To: Commissioners' Court

From: Deborah Clark
Purchasing Agent

Date: August 10, 2017

Re: Surplus Property Auction

Consider and possibly approve an auction of surplus property as authorized by Local Government Code §263.152 (a) (1) to be auctioned by Horn's Auction Inc. The auction is scheduled for Saturday, September 2, 2017 at 9:00 A.M.

Thank you.

JEFFERSON COUNTY, TEXAS
1149 PEARL STREET
BEAUMONT, TX 77701

SURPLUS PROPERTY SALE
HORN AUCTION

September 2, 2017

DEPARTMENT	DESCRIPTION OF PROPERTY	SERIAL NO.	ASSET NO.
ROAD & BRIDGE #3	1998 CASE IH MODEL #1120 19 HP MOWER	38908	
contact person: Jason Castille			
SHERIFF	BROWN CHAIR		17987
SHERIFF	BLUE CHAIR		11182
SHERIFF	2-DRAWER FILE CABINET		2062
SHERIFF	2-DRAWER FILE CABINET		18116
SHERIFF	CHAIR		17818
contact person: Jamie Miller			
AUDITING	2-DOOR WOODEN CABINET		10480
contact person: Rhonda Brode			

Approved by Commissioners' Court: _____

Jefferson County Constable Precinct 1

RECEIVED AUG 07 2017

EARL WHITE
1085 Pearl Street, Suite 103
Beaumont, TX 77701-3544
Phone: (409) 835-8450
Fax: (409) 839-2350
EMAIL: ewhite@co.jefferson.tx.us

August 7, 1917

Honorable Judge Jeff Branick
Commissioner Eddie Arnold, Pct. 1
Commissioner Brent Weaver, Pct. 2
Commissioner Michael Sinegal, Pct. 3
Commissioner, Everette "Bo" Alfred, Pct. 4

To Commissioners Court:

Dear Loma:

Please place on the Agenda for August 14, 2017 the enclosed Resolution Grant Application for the Jefferson County Constable's Office Rifle Resistant Body Armor Project to the Office of the Governor. Any Questions or concerns please contact me immediately.

Constable Earl White
Jefferson County Precinct 1

VC/

★★★★★★★★

AGENDA ITEM **August 14, 2017**

Consider and possibly approve a resolution authorizing the offices of the Jefferson Constables for Precincts 1,2,6,7 and 8 grant application to the Office of the Governor for the Rifle Resistant Body Armor Project. (Grant No. 3441801)

Resolution

STATE OF TEXAS §
§
COUNTY OF JEFFERSON

COMMISSIONERS' COURT
OF JEFFERSON COUNTY, TEXAS

BE IT REMEMBERED at a meeting of Commissioners' Court of Jefferson County, Texas, held on the 14th day of August, 2017, on motion made by Everette D. Alfred, Commissioner of Precinct No. 4, and seconded by Eddie Arnold, Commissioner of Precinct No. 1, the following Resolution was adopted:

Jefferson County Constable's Office Rifle Resistant Body Armor Project

WHEREAS, The Jefferson County Commissioner's Court finds it in the best interest of the citizens of Jefferson County Texas, and the safety of those peace officers that serve them, Funds are authorized by Senate Bill 12 appropriated by 85th Legislature that the Rifle-Resistant Body Armor Grant Program be operated for purchase of Body Armor Grant Program operated from February 1, 2018 to January 31, 2019; and

WHEREAS, the Jefferson County Constable's Office's PCT. 1, 2, 6, 7, 8 and its Deputies are Peace Officers commissioned of and by the State of Texas; and,

WHEREAS, the County of Jefferson finds it in the best interest of the citizens of Jefferson County, that the Jefferson County Constable's Office's Rifle Resistant Body Armor Grant Program be operated from February 1, 2018 to January 31, 2019; and,

WHEREAS, there is no requirement for matching funds for this grant; and,

WHEREAS, the County of Jefferson agrees that in the event of loss or misuse of the Criminal Justice Division funds, the County of Jefferson assures that the funds will be returned to the Criminal Justice Division in full.

WHEREAS, The Jefferson County Commissioner's Court designates The County Judge as the grantee's authorized official. The authorized official is given the power to apply for, accept, reject, alter or terminate the grant on behalf of the applicant agencies for the purchase of twenty-nine fitted Rifle Resistant Body Armor Vest for Jefferson County Constable's Office's PCT. 1, 2, 6, 7, and 8

NOW THEREFORE, BE IT RESOLVED that The Jefferson County Commissioner's Court approves submission of the grant application for the Jefferson County Constable's Office Rifle Resistant Body Armor project to the Office of the Governor.

SIGNED this 14th day of August, 2017.

Grant No.3441801

JUDGE JEFF BRANICK
COUNTY JUDGE

EDDIE ARNOLD
Commissioner, Pct. 1

MICHAEL S. SINEGAL
Commissioner, Pct. 3

BRENT A. WEAVER
Commissioner, Pct. 2

EVERETTE "BO" ALFRED
Commissioner, Pct. 4

RECEIVED AUG 07 2017

CHRISTOPHER L. BATES
CONSTABLE PCT. 2
JEFFERSON COUNTY

525 LAKESHORE DRIVE
SUB-COURTHOUSE
PORT ARTHUR, TEXAS 77640
PHONE: 409-983-8335
FAX: 409-983-8320

August 4, 2017

Jeff Branick, County Judge
1149 Pearl St.
Beaumont, TX 77701

Re: Agenda Item

Judge Branick,

I would like to place an item on the agenda for the Commissioner's Court Meeting Monday, August 14, 2017.

Please consider and possibly approve the hiring of Jevonne Smith-Pollard as a Part Time Deputy Constable with Constable Precinct 2 in accordance with Local Government Code (LGC) 86.011.

Thank you,

Christopher L. Bates
Constable, Pct. 2

Fran Lee

From: Joe Zurita <jzurita@co.jefferson.tx.us>
Sent: Thursday, August 03, 2017 4:58 PM
To: Fran Lee
Subject: fleet body repair

Can you please add to the next agenda the following request to commissioners court a budget amendment approval to move 20,000.00 from account 120-8095-417-30-37 to account 120-8095-417-40-08 to cover the cost of body repairs (wrecked vehicles) to two fleet vehicles?
Because there is not enough money in my automotive ccount to cover the cost. Thank you

Jose L. Zurita Jr.
Director of Service Center
7789 Viterbo Rd.
Nederland, Tx 77627
409-719-5937

To: Fran Lee
From: Mike Trahan
Re: Budget Transfer
Date: August 3, 2017

Fran,

I would like to request a transfer of $14,425.00 from 112-0202-431-3079 Crushed Stone to 112-0208-431-6036 ROW CO. & LATERAL ROADS. This is to cover the coast to remove and replace 71 SY of 6" Pavement, and 37 LF of curb using Class HES concrete. The location of this project is on Stillwater DR in precinct -2.
I do know that this has to go through Commissioner's Court.
Thanks for your help.

Sincerely,
Mike Trahan
Superintendent, Road and Bridge Precinct 2

MEMORANDUM

TO: COMMISSIONERS COURT

FROM: FRAN LEE

SUBJECT: BUDGET TRANSFER

DATE: AUGUST 9, 2017

The following budget transfer for the Marine Division is necessary to cover the remaining adjusted amount of the $280,068 match for the 2015 Port Security Grant.

865-0000-491-8074	Transfers Out–Port Security Grant $173,675	
865-3053-425-1043	Deputies	$ 68,000
865-3053-425-1098	Overtime	$ 70,000
865-3053-425-1099	Termination Allowance	$ 15,675
865-3053-425-2002	Employees Retirement	$ 20,000

Kristen,

Sorry for the delay in getting you this information. When I went back to reconcile the original 2015 Port security match to the original budget request of $174,750 from the FY 2016 budget I realized some additional increases were necessary over and above the building revision that was previously discussed. I am attaching a summary of the changes from the original budget to a new match amount of $280,068. The changes from the original budget request are as follows:

Match on Ship Channel Camera System $23,175
This match amount was inadvertently left off the original budget.

Additional Cost for Installation of Seats $15,048
This original estimate to install some of the seats was not included in the original budget.

Additional Cost for Building Revisions $67,600
Revised Estimate based on anticipated rebid of Building

Lower match required on replacement engines $ (505)
Actual prices came in lower

The above changes represent a $105,318 increase over the original budget request of $174,750. That is the bad news. The good news is the projected expenditures in the current FY 17 budget show the County to spend approximately $400,000 less than the original budget of $ 2,465,288. This projected savings would allow the County to do a budget amendment to move the savings to our 2015 grant match line item to cover the entire projected local match of $280,068.

Please let me know what action is needed by your board to approve this proposal and call me if you have any questions.

Jefferson County
Port Security Grant Budget Summary
EMW-2015-PU-00143

	Original Total	Federal	Local	Match Source
12 replacement engines	$ 248,000	$ 186,000	$ 62,000	Marine
22 replacement hydraulic shock absorbing seats and modifications to 2 boats	76,000	57,000	19,000	Marine
Build 6000 sq. ft. Storage and maintenance building adjacent to our hanger at Airport	375,000	281,250	93,750	Marine
Maintenance and Warranty for the Ship Channel Camera System	92,700	69,525		Marine
Total	$ 791,700	$ 593,775	$ 174,750	

Add:	
Correction for match on Ship Channel Camera System	23,175
Correction on additional cost of seat installation	15,048
Estimated Additional Cost on Building Revisions	67,600
Less: lower match on replacement engines	(505)
Revised 2015 Match	$ 280,068

NAME	AMOUNT	CHECK NO.	TOTAL
JURY FUND			
DAWN DONUTS	91.00	436906	
			91.00**
ROAD & BRIDGE PCT.#1			
ENTERGY	770.14	436709	
M&D SUPPLY	120.86	436724	
MUNRO'S	2,090.65	436728	
SOUTHERN TIRE MART, LLC	482.32	436770	
BROWN FENCING & CONSTRUCTION	2,425.00	436777	
EDDIE ARNOLD	535.59	436813	
MARTIN PRODUCT SALES LLC	4,606.72	436825	
ADVANCE AUTO PARTS	104.12	436867	
REPUBLIC SERVICES	45.00	436905	
CINTAS CORPORATION	126.61	436910	
GULF COAST	247.00	436916	
			11,554.01**
ROAD & BRIDGE PCT.#2			
ENTERGY	858.60	436709	
JEFFERSON COUNTY CREDIT CARDS	292.94	436848	
REPUBLIC SERVICES	72.60	436905	
			1,224.14**
ROAD & BRIDGE PCT. # 3			
CERTIFIED LABORATORIES	357.06	436691	
LOUIS' YAZOO SALES & SERVICE, LLC	119.90	436721	
MUNRO'S	80.40	436728	
OIL CITY TRACTORS, INC.	66.35	436735	
SMART'S TRUCK & TRAILER, INC.	329.10	436747	
VULCAN MATERIALS CO.	636.98	436764	
STRATTON INC.	14.87	436766	
HOWARD'S AUTO SUPPLY	177.46	436776	
MARTIN PRODUCT SALES LLC	16,600.32	436825	
BILL WILLIAMS	200.00	436831	
SOUTHEAST TEXAS PARTS AND EQUIPMENT	6.25	436880	
FELIX AAA AUTO & TRUCK PARTS LLC	35.04	436901	
CINTAS CORPORATION	30.46	436910	
HERC RENTALS INC	504.05	436912	
DEERE & COMPANY	47,235.55	436921	
			66,393.79**
ROAD & BRIDGE PCT.#4			
SPIDLE & SPIDLE	4,293.66	436675	
COASTAL WELDING SUPPLY	55.80	436696	
ENTERGY	12.10	436709	
CASH ADVANCE ACCOUNT	260.00	436716	
KAY ELECTRONICS, INC.	129.81	436719	
M&D SUPPLY	158.95	436724	
MUNRO'S	155.56	436728	
OIL CITY TRACTORS, INC.	472.04	436735	
SANITARY SUPPLY, INC.	83.57	436744	
SMART'S TRUCK & TRAILER, INC.	24.18	436747	
TRIANGLE AIR CARE, INC.	1,392.00	436759	
VULCAN MATERIALS CO.	19,216.41	436764	
UNITED STATES POSTAL SERVICE	.40	436790	
UNITED STATES POSTAL SERVICE	.40	436792	
EQUIPMENT DEPOT	88.70	436823	
MARTIN PRODUCT SALES LLC	10,719.02	436825	
HIGHTECH SIGNS	122.00	436828	
ALLSERV OF TEXAS LLC	38.00	436856	
ON TIME TIRE	131.99	436860	
ASCO	272.37	436870	
SOUTHEAST TEXAS PARTS AND EQUIPMENT	583.78	436880	
MARTIN MARIEETA MATERIALS	707.06	436898	
REPUBLIC SERVICES	72.60	436905	
GULF COAST	737.27	436916	
WAUKESHA-PEARCE INDUSTRIES LLC	343.50	436919	
			40,071.17**
ENGINEERING FUND			
STAR GRAPHICS SHARP	5,320.00	436751	

NAME	AMOUNT	CHECK NO.	TOTAL
VERIZON WIRELESS	243.32	436785	
			5,563.32**
PARKS & RECREATION			
CITY OF PORT ARTHUR - WATER DEPT.	80.80	436693	
ENTERGY	1,943.26	436709	
ENTERGY	76.13	436710	
AT&T	30.71	436750	
			2,130.90**
GENERAL FUND			
TAX OFFICE			
CURTIS 1000, INC.	493.85	436700	
OFFICE DEPOT	1,325.04	436734	
UNITED STATES POSTAL SERVICE	549.49	436790	
UNITED STATES POSTAL SERVICE	597.45	436792	
UNITED STATES POSTAL SERVICE	900.57	436793	
UNITED STATES POSTAL SERVICE	4,222.50	436794	
TEXAS DEPARTMENT OF MOTOR VEHICLES	4,500.00	436896	
			12,588.90*
COUNTY HUMAN RESOURCES			
PINNACLE EMPLOYEE TESTING	150.00	436738	
UNITED STATES POSTAL SERVICE	9.38	436790	
SOUTHEAST TEXAS OCCUPATIONAL MEDICI	160.00	436908	
			319.38*
AUDITOR'S OFFICE			
CASH ADVANCE ACCOUNT	432.30	436716	
OFFICE DEPOT	120.06	436734	
CDW COMPUTER CENTERS, INC.	32.79	436778	
UNITED STATES POSTAL SERVICE	14.91	436790	
UNITED STATES POSTAL SERVICE	20.37	436792	
			620.43*
COUNTY CLERK			
OFFICE DEPOT	647.13	436734	
UNITED STATES POSTAL SERVICE	278.75	436790	
UNITED STATES POSTAL SERVICE	269.74	436792	
ENGINEERING INNOVATION	190.10	436915	
			1,385.72*
COUNTY JUDGE			
OFFICE DEPOT	281.76	436734	
UNITED STATES POSTAL SERVICE	2.02	436790	
UNITED STATES POSTAL SERVICE	.46	436792	
FRANCES BLAIR BETHEA	1,000.00	436845	
JEFFERSON COUNTY CREDIT CARDS	59.00	436848	
TARA SHELANDER	500.00	436883	
JAN GIROUARD & ASSOCIATES LLC	600.00	436907	
			2,443.24*
RISK MANAGEMENT			
UNITED STATES POSTAL SERVICE	1.61	436790	
UNITED STATES POSTAL SERVICE	1.67	436792	
			3.28*
COUNTY TREASURER			
UNITED STATES POSTAL SERVICE	60.60	436790	
UNITED STATES POSTAL SERVICE	184.54	436792	
LEXISNEXIS- ACCURINT	118.45	436844	
			363.59*
PRINTING DEPARTMENT			
OLMSTED-KIRK PAPER	120.00	436736	
			120.00*
PURCHASING DEPARTMENT			
FED EX	31.24	436705	
PORT ARTHUR NEWS, INC.	378.30	436739	
UNIVERSITY OF TEXAS AT AUSTIN	130.00	436763	
UNITED STATES POSTAL SERVICE	3.91	436790	

NAME	AMOUNT	CHECK NO.	TOTAL
UNITED STATES POSTAL SERVICE	4.09	436792	
			547.54*
GENERAL SERVICES			
OLMSTED-KIRK PAPER	1,060.00	436736	
TEXAS WILDLIFE DAMAGE MGMT FUND	2,700.00	436754	
JEFFERSON COUNTY CREDIT CARDS	4.12	436848	
TFORCE FINAL MILE	239.46	436920	
			4,003.58*
DATA PROCESSING			
DAVID A. DOMINGUEZ	1,125.80	436701	
CDW COMPUTER CENTERS, INC.	4,681.07	436778	
LEXISNEXIS- ACCURINT	118.45	436844	
			5,925.32*
VOTERS REGISTRATION DEPT			
SOUTHERN COMPUTER WAREHOUSE	2,364.45	436682	
UNITED STATES POSTAL SERVICE	139.49	436790	
UNITED STATES POSTAL SERVICE	128.72	436792	
AMG PRINTING & MAILING LLC	125.00	436928	
			2,757.66*
ELECTIONS DEPARTMENT			
OFFICE DEPOT	16.58	436734	
UNITED STATES POSTAL SERVICE	2.38	436790	
ELECTION ADMINISTRATION REPORT	219.00	436797	
JEFFERSON COUNTY CREDIT CARDS	382.01	436848	
			619.97*
DISTRICT ATTORNEY			
CASH ADVANCE ACCOUNT	55.00	436716	
KIRKSEY'S SPRINT PRINTING	24.95	436720	
TEXAS DISTRICT & COUNTY ATTY ASSN.	950.00	436755	
UNITED STATES POSTAL SERVICE	134.40	436790	
UNITED STATES POSTAL SERVICE	187.30	436792	
CHRISTOPHER CADENA	651.56	436814	
LEXISNEXIS- ACCURINT	355.35	436844	
JEFFERSON COUNTY CREDIT CARDS	28.40	436848	
KATHLEEN KENNEDY	525.96	436884	
TRANSUNION RISK AND ALTERNATIVE	111.00	436890	
TATIANA ZELEZNIACK	115.56	436900	
FUNCTION 4 LLC	2,149.00	436917	
QUENTIN PRICE	812.00	436922	
CRAIG DOMMERT	12.73	436932	
KAREN BAUER	365.00	436933	
			6,478.21*
DISTRICT CLERK			
KIRKSEY'S SPRINT PRINTING	30.00	436720	
OFFICE DEPOT	487.53	436734	
UNITED STATES POSTAL SERVICE	354.27	436790	
UNITED STATES POSTAL SERVICE	515.93	436792	
TINA CLUBB	22.00	436899	
			1,409.73*
CRIMINAL DISTRICT COURT			
DAVID GROVE	1,657.22	436676	
DAVID GROVE	8,750.00	436677	
THOMAS J. BURBANK PC	600.00	436688	
CRISTY SMITH	1,896.35	436689	
DONALD W. DUESLER & ASSOC.	8,750.00	436703	
TRAVIS EVANS	800.00	436704	
CASH ADVANCE ACCOUNT	780.26	436716	
OFFICE DEPOT	49.99	436734	
KEVIN PAULA SEKALY PC	8,750.00	436745	
KEVIN S. LAINE	800.00	436775	
UNITED STATES POSTAL SERVICE	6.56	436790	
UNITED STATES POSTAL SERVICE	1.73	436792	
ALLEN PARKER	8,750.00	436846	
SAMUEL & SON LAW FIRM PLLC	8,750.00	436887	
			50,342.11*
58TH DISTRICT COURT			

NAME	AMOUNT	CHECK NO.	TOTAL
JEFFERSON CTY. BAR ASSOCIATION	125.00	436715	
SOUTHEAST TEXAS WATER	59.90	436749	
UNITED STATES POSTAL SERVICE	.40	436790	
			185.30*
136TH DISTRICT COURT			
JEFFERSON CTY. BAR ASSOCIATION	100.00	436715	
LEXIS-NEXIS	69.00	436795	
SWEET SOUTHERN SOUND	145.00	436876	
			314.00*
252ND DISTRICT COURT			
GAYLYN COOPER	1,575.00	436673	
DAVID W BARLOW	750.00	436684	
OFFICE DEPOT	21.49	436734	
BRUCE N. SMITH	800.00	436748	
BRACK JONES JR.	855.76	436772	
BRACK JONES JR.	8,750.00	436773	
UNITED STATES POSTAL SERVICE	67.52	436790	
UNITED STATES POSTAL SERVICE	2.61	436792	
LANGSTON ADAMS	1,600.00	436802	
DUSTIN R. GALMOR	2,793.75	436851	
MATUSKA LAW FIRM	22,395.00	436881	
			39,611.13*
279TH DISTRICT COURT			
JACK LAWRENCE	1,050.00	436678	
PHILLIP DOWDEN	75.00	436681	
MARVA PROVO	500.00	436740	
ANITA F. PROVO	75.00	436741	
UNITED STATES POSTAL SERVICE	1.21	436792	
LEXIS-NEXIS	56.00	436795	
JOEL WEBB VAZQUEZ	400.00	436810	
RONALD PLESSALA	325.00	436837	
WILLIAM FORD DISHMAN	75.00	436877	
MATUSKA LAW FIRM	75.00	436881	
MELANIE AIREY	150.00	436892	
			2,782.21*
317TH DISTRICT COURT			
UNITED STATES POSTAL SERVICE	.92	436790	
LEXIS-NEXIS	68.00	436795	
JUDY PAASCH	2,323.90	436812	
			2,392.82*
JUSTICE COURT-PCT 1 PL 1			
UNITED STATES POSTAL SERVICE	37.49	436790	
UNITED STATES POSTAL SERVICE	44.15	436792	
LEXISNEXIS- ACCURINT	118.45	436844	
			200.09*
JUSTICE COURT-PCT 1 PL 2			
LEXISNEXIS- ACCURINT	118.45	436844	
			118.45*
JUSTICE COURT-PCT 2			
LEXISNEXIS- ACCURINT	118.45	436844	
			118.45*
JUSTICE COURT-PCT 4			
LEXISNEXIS- ACCURINT	118.45	436844	
			118.45*
JUSTICE COURT-PCT 6			
UNITED STATES POSTAL SERVICE	48.69	436790	
UNITED STATES POSTAL SERVICE	44.78	436792	
LEXISNEXIS- ACCURINT	118.45	436844	
			211.92*
JUSTICE COURT-PCT 7			
OFFICE DEPOT	846.14	436734	
LEXISNEXIS- ACCURINT	118.45	436844	
			964.59*
JUSTICE OF PEACE PCT. 8			

NAME	AMOUNT	CHECK NO.	TOTAL
LEXISNEXIS- ACCURINT	118.45	436844	
			118.45*
COUNTY COURT AT LAW NO.1			
UNITED STATES POSTAL SERVICE	11.27	436792	
			11.27*
COUNTY COURT AT LAW NO. 2			
THOMAS J. BURBANK PC	300.00	436688	
DONALD W. DUESLER & ASSOC.	250.00	436702	
TRAVIS EVANS	300.00	436704	
UNITED STATES POSTAL SERVICE	4.43	436790	
UNITED STATES POSTAL SERVICE	2.02	436792	
JEFFERSON COUNTY CREDIT CARDS	275.00	436848	
ALEX BILL III	250.00	436853	
JARED GILTHORPE	250.00	436885	
			1,631.45*
COUNTY COURT AT LAW NO. 3			
UNITED STATES POSTAL SERVICE	7.77	436790	
UNITED STATES POSTAL SERVICE	10.08	436792	
JOEL WEBB VAZQUEZ	250.00	436810	
SEAN NGUYEN	300.00	436909	
THE MAYO LAW FIRM PLLC	250.00	436918	
			817.85*
COURT MASTER			
UNITED STATES POSTAL SERVICE	.92	436790	
UNITED STATES POSTAL SERVICE	.81	436792	
LEXIS-NEXIS	68.00	436796	
			69.73*
MEDIATION CENTER			
UNITED STATES POSTAL SERVICE	11.69	436790	
UNITED STATES POSTAL SERVICE	8.04	436792	
KARA HAWTHORN	156.22	436855	
			175.95*
ALTERNATIVE SCHOOL			
COASTAL WELDING SUPPLY	26.88	436696	
			26.88*
SHERIFF'S DEPARTMENT			
ENTERGY	1,064.25	436709	
LYNN PEAVEY CO., INC.	129.50	436723	
AT&T	33.65	436750	
UNITED STATES POSTAL SERVICE	1,294.60	436790	
UNITED STATES POSTAL SERVICE	1,268.65	436792	
BEAUMONT OCCUPATIONAL SERVICE, INC.	32.95	436798	
TRANSUNION RISK AND ALTERNATIVE	483.00	436889	
GALLS LLC	107.53	436894	
REPUBLIC SERVICES	45.00	436905	
CINTAS CORPORATION	299.00	436910	
			4,758.13*
CRIME LABORATORY			
JEFFERSON COUNTY CREDIT CARDS	483.95	436848	
			483.95*
JAIL - NO. 2			
BEAUMONT TRACTOR COMPANY	117.71	436685	
CITY OF BEAUMONT - WATER DEPT.	16.00	436692	
COBURN'S, BEAUMONT BOWIE (1)	141.03	436697	
W.W. GRAINGER, INC.	1,407.82	436706	
ENTERGY	528.85	436709	
HERNANDEZ OFFICE SUPPLY, INC.	100.36	436713	
M&D SUPPLY	113.68	436724	
OFFICE DEPOT	599.85	436734	
SANITARY SUPPLY, INC.	426.00	436744	
WHOLESALE ELECTRIC SUPPLY CO.	11.47	436767	
OAK FARM DAIRY	1,935.50	436774	
WALMART COMMUNITY BRC	302.76	436788	
LOWE'S HOME CENTERS, INC.	57.84	436801	

NAME	AMOUNT	CHECK NO.	TOTAL
SUNBELT RENTALS	72.00	436804	
UNITED RENTALS	70.26	436817	
INTERSTATE ALL BATTERY CENTER - BMT	97.93	436841	
JEFFERSON COUNTY CREDIT CARDS	150.00	436848	
EMERGENCY POWER SERVICE	433.50	436859	
SAM'S CLUB DIRECT	327.32	436863	
SAM'S CLUB DIRECT	15.00	436864	
CONSTELLATION NEWENERGY - GAS DIVIS	1,633.04	436868	
CONMED INC	262,904.23	436869	
FROGWASH PRESSURE WASHING	800.00	436873	
GALLS LLC	10.95	436894	
LONE STAR UNIFORMS	119.97	436902	
REPUBLIC SERVICES	2,490.00	436905	
IMPACT WASTE LLC	360.00	436914	
FOOD MARKETING CONCEPTS INC	17,707.93	436924	
HARDIE'S FRESH FOODS	3,339.33	436925	
NATIONAL FOOD GROUP INC	3,904.12	436926	
			300,194.45*
JUVENILE PROBATION DEPT.			
EDWARD B. GRIPON, M.D., P.A.	1,900.00	436707	
CASH ADVANCE ACCOUNT	801.40	436716	
OFFICE DEPOT	302.20	436734	
UNITED STATES POSTAL SERVICE	3.86	436790	
UNITED STATES POSTAL SERVICE	1.21	436792	
LATASHA DILL	437.63	436819	
LYNN BIERHALTER	123.05	436821	
NISHA AMIN	1,200.00	436832	
LATONYA DOUCET	223.09	436834	
BRIA LYNCH	15.52	436836	
JOSH CUYOS	206.51	436882	
TANISHA GRIFFIN	260.55	436888	
ROXANA MITCHELL	206.51	436897	
CHRISTAL CHANNELL	158.36	436903	
KAREN RIGGS	135.89	436904	
ANNIE JONES	198.48	436923	
			6,174.26*
JUVENILE DETENTION HOME			
ALL STAR PLUMBING	195.00	436680	
BINSWANGER GLASS CO.	2,987.87	436687	
ENTERGY	9,308.15	436709	
CASH ADVANCE ACCOUNT	589.80	436716	
SANITARY SUPPLY, INC.	1,115.27	436744	
CHARMTEX INC.	763.60	436806	
FLOWERS FOODS	82.53	436808	
BEN E KEITH FOODS	206.41	436809	
KAREN ROBERTS	900.00	436840	
A1 FILTER SERVICE COMPANY	183.79	436858	
EXCEL MEDICAL WASTE LLC	70.00	436895	
REPUBLIC SERVICES	455.00	436905	
			16,857.42*
CONSTABLE PCT 1			
UNITED STATES POSTAL SERVICE	54.95	436790	
UNITED STATES POSTAL SERVICE	45.59	436792	
LEXISNEXIS- ACCURINT	118.45	436844	
SIRCHIE FINGER PRINT LABORATORIES	123.50	436852	
			342.49*
CONSTABLE-PCT 2			
LEXISNEXIS- ACCURINT	118.45	436844	
			118.45*
CONSTABLE-PCT 4			
DISH NETWORK	56.50	436830	
			56.50*
CONSTABLE-PCT 6			
UNITED STATES POSTAL SERVICE	9.27	436790	
UNITED STATES POSTAL SERVICE	14.57	436792	
LEXISNEXIS- ACCURINT	118.45	436844	
			142.29*
COUNTY MORGUE			

NAME	AMOUNT	CHECK NO.	TOTAL
SALAM INTERNATIONAL	1,383.39	436780	
			1,383.39*
HEALTH AND WELFARE NO. 1			
CALVARY MORTUARY	1,429.00	436690	
CLAYBAR FUNERAL HOME, INC.	3,498.00	436695	
JOURNAL WATCH, INC.	79.50	436718	
THE MEDICAL LETTER	79.50	436727	
NEW ENGLAND JOURNAL OF MEDICINE	94.50	436730	
OFFICE DEPOT	1,404.84	436734	
AUSTIN CECIL WALKES MD PA	2,932.58	436765	
MCKESSON MEDICAL-SURGICAL INC	212.47	436779	
UNITED STATES POSTAL SERVICE	70.68	436790	
UNITED STATES POSTAL SERVICE	92.74	436792	
TINA CHAMPAGNE	32.10	436835	
LEXISNEXIS- ACCURINT	118.45	436844	
PROCTOR'S MORTUARY INC	1,500.00	436847	
JEFFERSON COUNTY CREDIT CARDS	25.94	436848	
EXCEL MEDICAL WASTE LLC	70.00	436895	
			11,640.30*
HEALTH AND WELFARE NO. 2			
JOURNAL WATCH, INC.	79.50	436718	
THE MEDICAL LETTER	79.50	436727	
NEW ENGLAND JOURNAL OF MEDICINE	94.50	436730	
OFFICE DEPOT	14.42	436734	
AUSTIN CECIL WALKES MD PA	2,932.58	436765	
LEXISNEXIS- ACCURINT	118.45	436844	
			3,318.95*
CHILD WELFARE UNIT			
J.C. PENNEY'S	482.90	436799	
SEARS COMMERICAL CREDIT	297.16	436800	
			780.06*
ENVIRONMENTAL CONTROL			
TEXAS ENVIRONMENTAL HEALTH ASSN.	700.00	436756	
			700.00*
INDIGENT MEDICAL SERVICES			
CARDINAL HEALTH 110 INC	72,311.41	436875	
			72,311.41*
MAINTENANCE-BEAUMONT			
SPIDLE & SPIDLE	2,610.75	436675	
CITY OF BEAUMONT - LANDFILL	143.00	436683	
BINSWANGER GLASS CO.	827.50	436687	
CERTIFIED LABORATORIES	1,573.12	436691	
CONSOLIDATED ELECTRICAL DIST INC.	27.30	436699	
W.W. GRAINGER, INC.	549.48	436706	
ENTERGY	6,335.08	436709	
M&D SUPPLY	91.11	436724	
RITTER @ HOME	90.06	436742	
RALPH'S INDUSTRIAL ELECTRONICS	314.40	436743	
ACE IMAGEWEAR	191.83	436746	
AT&T	656.43	436750	
WHOLESALE ELECTRIC SUPPLY CO.	685.98	436767	
WORTH HYDROCHEM	250.00	436768	
MSC SYSTEMS	113.25	436771	
BAKER DISTRIBUTING COMPANY	28.23	436807	
BELT SOURCE	92.77	436822	
VOSS LIGHTING	55.20	436827	
ATTABOY TERMITE & PEST CONTROL	135.00	436842	
JEFFERSON COUNTY CREDIT CARDS	658.00	436848	
LANDSCAPER'S WHOLESALE MARKET	293.70	436854	
A1 FILTER SERVICE COMPANY	732.70	436858	
INDUSTRIAL & COMMERCIAL MECHANICAL	8,047.00	436862	
CARRIER ENTERPRISE LLC	4,534.83	436872	
FRED MILLER'S OUTDOOR EQUIPMENT LLC	627.78	436893	
REPUBLIC SERVICES	1,365.00	436905	
			31,029.50*
MAINTENANCE-PORT ARTHUR			

NAME	AMOUNT	CHECK NO.	TOTAL
ENTERGY	6,299.88	436709	
WALMART COMMUNITY BRC	12.98	436788	
			6,312.86*
MAINTENANCE-MID COUNTY			
ENTERGY	2,538.41	436709	
REPUBLIC SERVICES	109.00	436905	
			2,647.41*
SERVICE CENTER			
SPIDLE & SPIDLE	7,134.80	436675	
J.K. CHEVROLET CO.	114.91	436714	
MUNRO'S	39.70	436728	
PHILPOTT MOTORS, INC.	302.84	436737	
JEFFERSON CTY. TAX OFFICE	7.50	436782	
JEFFERSON CTY. TAX OFFICE	7.50	436783	
JEFFERSON CTY. TAX OFFICE	7.50	436784	
VOYAGER FLEET SYSTEM, INC.	15,552.10	436805	
BUMPER TO BUMPER	57.00	436811	
C & I OIL COMPANY INC	1,637.48	436838	
MIGHTY OF SOUTHEAST TEXAS	87.51	436857	
SPANKY'S WRECKER SERVICE INC	245.00	436861	
ACTION OVERHEAD DOOR	5,502.50	436866	
REPUBLIC SERVICES	72.60	436905	
DENNIS LOWE	271.92	436911	
MICHAEL GUILLORY	10.00	436930	
OSCAR VARA	39.72	436931	
			31,090.58*
VETERANS SERVICE			
UNITED STATES POSTAL SERVICE	4.62	436790	
UNITED STATES POSTAL SERVICE	3.01	436792	
HILARY GUEST	98.33	436803	
JEFFERSON COUNTY CREDIT CARDS	61.63	436848	
			167.59*
			630,307.64**
MOSQUITO CONTROL FUND			
CITY OF NEDERLAND	42.21	436694	
ENTERGY	675.25	436709	
MUNRO'S	82.20	436729	
UNITED PARCEL SERVICE	12.20	436762	
REPUBLIC SERVICES	72.60	436905	
			884.46**
SECURITY FEE FUND			
TRIANGLE COMPUTER & TELEPHONE	4,230.00	436760	
JEROME WATKINS	152.20	436929	
			4,382.20**
GRANT A STATE AID			
OFFICE DEPOT	298.20	436734	
VERIZON WIRELESS	26.01	436785	
4M YOUTH SERVICES	5,231.30	436824	
			5,555.51**
COMMUNITY SUPERVISION FND			
DIANNA L. COLUMBUS	149.80	436698	
OFFICE DEPOT	619.20	436734	
TDCAA BOOK ORDERS	286.09	436753	
UNITED STATES POSTAL SERVICE	85.24	436790	
UNITED STATES POSTAL SERVICE	131.13	436792	
JCCSC	693.00	436850	
EXCEL MEDICAL WASTE LLC	280.00	436895	
			2,244.46**
JEFF. CO. WOMEN'S CENTER			
BELL'S LAUNDRY	1,254.11	436686	
LUBE SHOP	44.48	436722	
M&D SUPPLY	112.34	436724	
KIM MCKINNEY, LPC, LMFT	75.00	436726	
OFFICE DEPOT	57.43	436734	
PHILPOTT MOTORS, INC.	3,498.09	436737	

NAME	AMOUNT	CHECK NO.	TOTAL
SYSCO FOOD SERVICES, INC.	714.13	436752	
TEXAS FIRE & COMMUNICATIONS	90.00	436781	
TOWER COMMUNICATIONS, INC.	60.00	436787	
BEN E KEITH FOODS	670.49	436809	
ATTABOY TERMITE & PEST CONTROL	50.00	436842	
MATERA PAPER COMPANY INC	100.74	436871	
EXCEL MEDICAL WASTE LLC	35.00	436895	
REPUBLIC SERVICES	91.00	436905	
			6,852.81**
COMMUNITY CORRECTIONS PRG			
M&D SUPPLY	34.10	436724	
			34.10**
COUNTY CLK RECORDS ARCHIV			
OFFICE DEPOT	1,046.11	436734	
			1,046.11**
DEPUTY SHERIFF EDUCATION			
JEFFERSON COUNTY CREDIT CARDS	225.00	436848	
			225.00**
HOTEL OCCUPANCY TAX FUND			
THERMACON SERVICE	640.79	436679	
MUNRO'S	83.61	436728	
AT&T	185.02	436750	
TRI-CITY COFFEE SERVICE	92.45	436761	
MATERA PAPER COMPANY INC	206.69	436871	
REPUBLIC SERVICES	72.60	436905	
DONNY AVERY	77.58	436913	
			1,358.74**
CAPITAL PROJECTS FUND			
ALLCO, INC.	166,722.45	436786	
GOWAN INC	50,435.00	436826	
FIRETROL PROTECTION SYSTEMS, INC.	19,705.71	436839	
			236,863.16**
AIRPORT FUND			
A&B OUTDOOR EQUIPMENT	19.79	436670	
HILO / O'REILLY AUTO PARTS	6.00	436672	
TRIANGLE LOCKSMITH	270.00	436674	
SPIDLE & SPIDLE	1,084.20	436675	
COASTAL WELDING SUPPLY	104.80	436696	
FED EX	60.73	436705	
ENTERGY	13,798.22	436712	
KAY ELECTRONICS, INC.	255.50	436719	
MCCOWN PAINT & SUPPLY OF TEXAS	250.00	436725	
NOACK LOCKSMITH	21.00	436731	
PHILPOTT MOTORS, INC.	61.97	436737	
TRI-CITY COFFEE SERVICE	242.60	436761	
BUBBA'S AIR CONDITIONING	570.00	436769	
UNITED STATES POSTAL SERVICE	5.06	436792	
LOWE'S HOME CENTERS, INC.	291.20	436801	
DISH NETWORK	113.01	436829	
UNIFIRST HOLDINGS INC	133.63	436843	
JEFFERSON COUNTY CREDIT CARDS	514.00	436848	
CRAWFORD ELECTRIC SUPPLY COMPANY	714.84	436865	
CARRIER ENTERPRISE LLC	460.35	436872	
SOUTHEAST TEXAS PARTS AND EQUIPMENT	39.98	436880	
EASTERN AVIATION FUELS INC	29,826.52	436886	
REPUBLIC SERVICES	217.80	436905	
			49,061.20**
SE TX EMP. BENEFIT POOL			
STANDARD INSURANCE COMPANY	22,279.99	436818	
RELIANCE STANDARD LIFE INSURANCE	5,703.11	436820	
GROUP ADMINISTRATIVE CONCEPTS INC	856.00	436849	
COMPASS PROFESSIONAL HEALTH SERVICE	6,365.00	436878	
SA BENEFITS SERVICES LLC	29,571.79	436879	
			64,775.89**
SETEC FUND			

NAME	AMOUNT	CHECK NO.	TOTAL
REPUBLIC SERVICES	812.80	436905	
LIABILITY CLAIMS ACCOUNT			812.80**
DONNA YORK	1,438.74	436934	
WORKER'S COMPENSATION FD			1,438.74**
TRISTAR RISK MANAGEMENT	2,481.94	436815	
TRISTAR RISK MANAGEMENT	13,500.10	436816	
SHERIFF'S FORFEITURE FUND			15,982.04**
A-1 TINT & ACCESSORIES	254.00	436671	
W.W. GRAINGER, INC.	77.21	436706	
JEFFERSON COUNTY CREDIT CARDS	439.13	436848	
GALLS LLC	208.59	436894	
PAYROLL FUND			978.93**
JEFFERSON CTY. - FLEXIBLE SPENDING	13,842.50	436640	
CLEAT	306.00	436641	
JEFFERSON CTY. TREASURER	16,680.11	436642	
RON STADTMUELLER - CHAPTER 13	530.00	436643	
INTERNAL REVENUE SERVICE	475.00	436644	
JEFFERSON CTY. ASSN. OF D.S. & C.O.	4,380.00	436645	
JEFFERSON CTY. COMMUNITY SUP.	9,540.19	436646	
JEFFERSON CTY. TREASURER - HEALTH	467,100.14	436647	
JEFFERSON CTY. TREASURER - GENERAL	30.00	436648	
JEFFERSON CTY. TREASURER - PAYROLL	1,589,147.19	436649	
JEFFERSON CTY. TREASURER - PAYROLL	613,510.56	436650	
MONY LIFE INSURANCE OF AMERICA	126.84	436651	
POLICE & FIRE FIGHTERS' ASSOCIATION	2,880.31	436652	
TGSLC	388.77	436653	
UNITED WAY OF BEAUMONT& N JEFFERSON	8.00	436654	
JEFFERSON CTY. TREASURER - TCDRS	586,805.46	436655	
OPPENHEIMER FUNDS DISTRIBUTOR, INC	1,539.99	436656	
JEFFERSON COUNTY TREASURER	2,638.49	436657	
JEFFERSON COUNTY - TREASURER -	6,334.79	436658	
NECHES FEDERAL CREDIT UNION	50,239.71	436659	
JEFFERSON COUNTY - NATIONWIDE	54,320.55	436660	
SBA - U S DEPARTMENT OF TREASURY	168.49	436661	
U S DEPARTMENT OF TREASURY	170.86	436662	
WILLIAM E HEITKAMP	748.53	436663	
JOHN TALTON	2,257.70	436664	
IL DEPT OF HEALTCARD AND FAMILY SER	49.85	436665	
BELINDA M ZURITA	230.77	436666	
CONSERVE	143.22	436667	
JEFFERSON CTY. TREASURER - PAYROLL	11,282.50	436668	
JEFFERSON CTY. TREASURER - PAYROLL	11,282.50	436717	
APPELLATE JUDICIAL SYSTEM			3,447,159.02**
9TH COURT OF APPEALS	1,950.00	436833	
ORCA - IKE			1,950.00**
TEXAS GENERAL LAND OFFICE	2,414.46	436757	
MARINE DIVISION			2,414.46**
ENTERGY	556.99	436709	
HELICOPTER INSTITUTE INC	2,000.00	436927	
ASAP - CONSTABLE			2,556.99**
OFFICE DEPOT	114.63	436734	
HIGGINBOTHAM INSURANCE AGENCY INC	71.00	436891	
GLO IKE ROUND 2			185.63**
TEXAS GENERAL LAND OFFICE	430,101.25	436758	
			430,101.25**
			5,034,199.47***

AGENDA ITEM **August 14, 2017**

Consider, possibly approve and authorize the County Judge to execute an Inter-local agreement between Jefferson County, Texas and the City of Port Arthur, Texas for road repairs, shrubbery and weed control pursuant to Sec.§ 791.014, Texas Government Code.

STATE OF TEXAS)(
)(INTERLOCAL AGREEMENT
COUNTY OF JEFFERSON)(

WHEREAS, Jefferson County, Texas, by and through its Commissioners' Court as authorized by Chapter 791 of the Government Code and the City of Port Arthur/Pleasure Island Commission alone with the Corps of Engineers, a body politic of the State of Texas, for the mutual benefit of the citizens they serve, desire to enter into a contract to provide certain services to each other, and;

WHEREAS, Jefferson County, Texas through Commissioner Precinct Three has, from time to time, capacity to provide labor and equipment suitable for the repair of roadways, and;

WHEREAS, the City of Port Arthur, has, from time to time, the need to maintain and repair streets and roadways which it owns, and;

WHEREAS, the city of Port Arthur, does not have the labor or equipment suited for such construction and/or maintenance, and;

Now, therefore, know all men by the these presents:

City of Port Arthur and Jefferson County hereby agree as follows:

1. Jefferson County shall furnish labor and equipment to repair certain streets, listed on Exhibit A incorporated herein when and as determined at the discretion of the Commissioner for Jefferson County Precinct Three, subject to the requirements of Section 791.014 of the Government Code.
2. The City of Port Arthur shall furnish Precinct Three, with materials needed in exchange for the labor and equipment necessary to accomplish this work.
3. Consideration for the repairs herein contemplated shall be determined and mutually agreed from time to time depending on the scope of the repair needed.
4. This agreement shall be effective on the date of its execution and may be terminated at the will of either party.
5. This agreement shall be construed according to the laws of the State of Texas.
6. Nothing in this agreement shall be construed to create the existence of an agency relationship between the parties.
7. Any employee of a party performing services pursuant to this agreement shall not be deemed to be the agent of the party receiving services under this agreement.\
8. The parties further agree, pursuant to Sec. 791.015, Texas Government Code, that any dispute regarding the terms of this agreement will be submitted to an agreed upon mediator for resolution.

The parties further agree, pursuant to Sec. 791.015, Texas Government Code, that any dispute regarding the terms of this agreement will be submitted to an agreed upon mediator for resolution.

Executed on the _____ day of _____, 2017.

_____
Jeff R. Branick
Jefferson County Judge

_____
Derrick Freeman, Mayor
Mayor, City of Port Arthur

DERRICK FORD FREEMAN, MAYOR
CAL J. JONES, MAYOR PRO TEM

COUNCIL MEMBERS:
RAYMOND SCOTT, JR.
THOMAS J. KINLAW, III
HAROLD DOUCET SR.
WILLIE "BAE" LEWIS, JR.
OSMAN SWATI
CHARLOTTE MOSES
KAPRINA FRANK

City of Port Arthur Texas

BRIAN McDOUGAL
CITY MANAGER

SHERRI BELLARD, TRMC
CITY SECRETARY

VAL TIZENO
CITY ATTORNEY

July 20, 2017

County Commissioner Michael Sinegal, Comm. Pct. 3
Jefferson County Sub Courthouse
525 Lakeshore Drive
Port Arthur, Texas 77640

RE: Pleasure Island – Shrubbery/Weed Control

Dear County Commissioner Sinegal:

The City of Port Arthur will accept and appreciate any help the county can provide for the shrubbery/weed control on Pleasure Island.

Thank you so much for your continued partnership.

Sincerely,

Dr. Jimmie Johnson
Assistant City Manager
City of Port Arthur

/bw

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

July 19, 2017

Real Estate Division

SUBJECT: Agreement as to Pleasure Island Levee Roads and Placement Areas

Mr. Brian McDougal
City Manager
City Hall
444 4th St. Suite 410
Port Arthur, TX 77641

Dear Mr. McDougal:

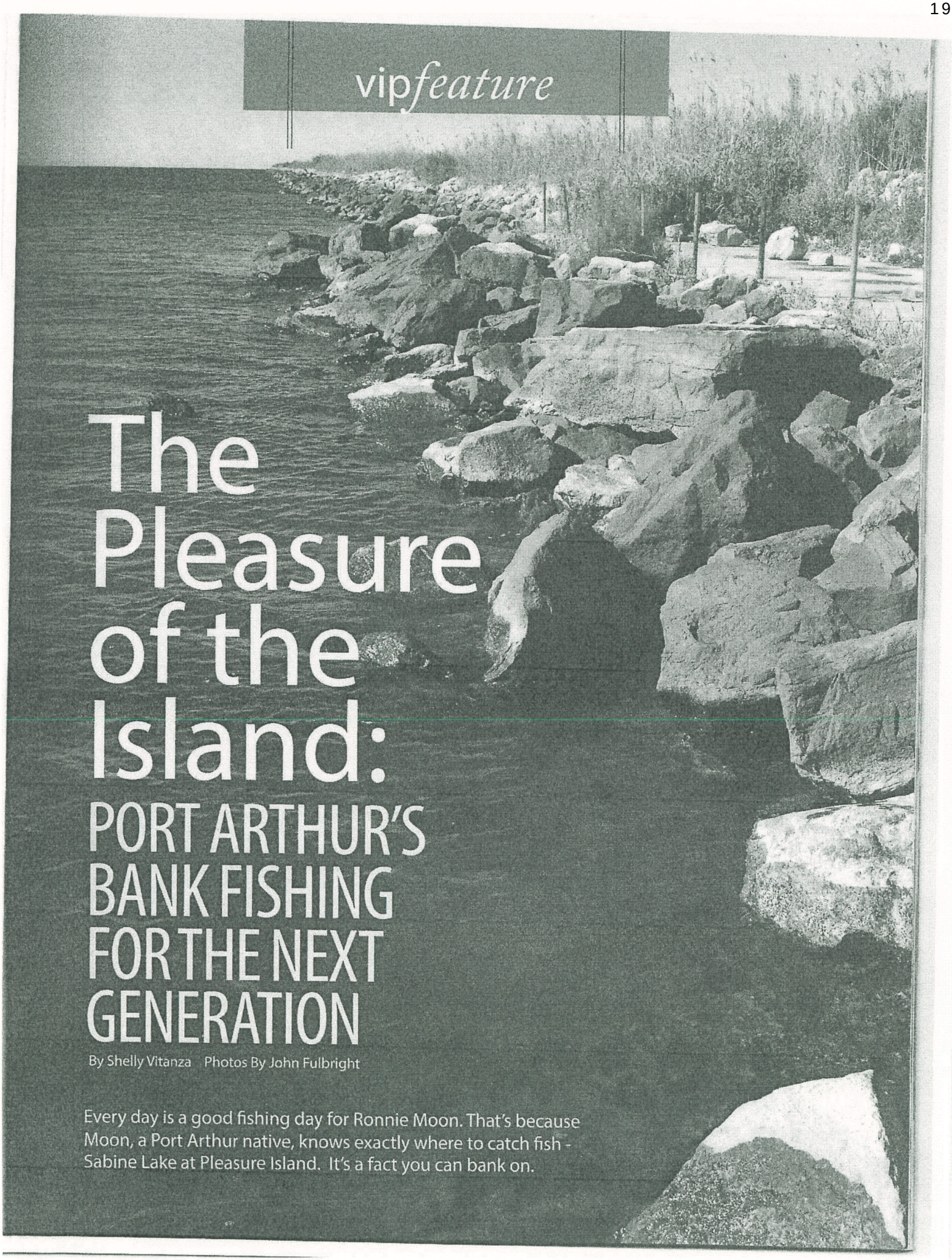
Per the Tri-Party agreement between the U.S. Army Corps of Engineers, City of Port Arthur and Pleasure Island Commission dated December 11, 2006, The Corps supports The City of Port Arthur's effort to enforce and maintain Pleasure Island levee roads per the City of Port Arthur's Code of Ordinance Section 34-53.

If you have any further questions or require additional information, please contact Elizabeth Blake at (409) 766-3034 or by email at elizabeth.a.blake@usace.army.mil.

Sincerely,

Thomas J. Seymour, MAI, AL-GRS
Chief, Technical Services Branch (M&D)
Galveston District
U.S. Army Corps of Engineers

vip*feature*



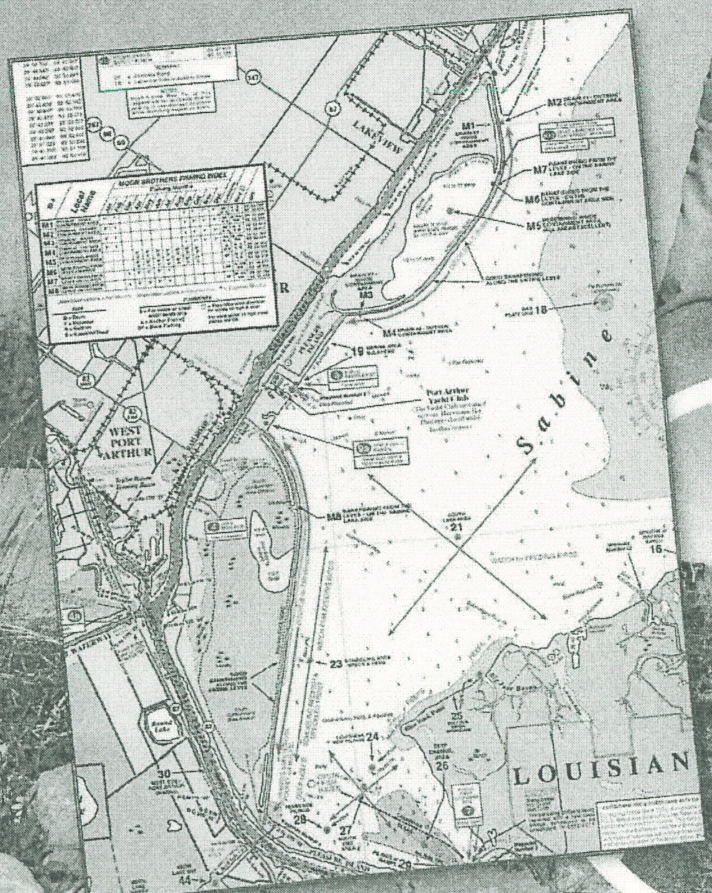
The Pleasure of the Island:

PORT ARTHUR'S BANK FISHING FOR THE NEXT GENERATION

By Shelly Vitanza Photos By John Fulbright

Every day is a good fishing day for Ronnie Moon. That's because Moon, a Port Arthur native, knows exactly where to catch fish - Sabine Lake at Pleasure Island. It's a fact you can bank on.

Locations matter, too. Specific locations where the Moon brothers have had success catching "the big one" are identified on "Hook-N-Line Offshore Fishing Maps," on this page. See the "Moon Brothers Fishing Index" designating locations and times of the year for fishing specific locations.







NOTICE OF MEETING OF JEFFERSON COUNTY COMMISSIONERS' COURT

Notice is hereby given that a meeting of Jefferson County, Texas Commissioners' Court will be held on August 14, 2017, at 1:30 p.m. in the Commissioners Courtroom on the fourth floor of the Jefferson County Courthouse located at 1149 Pearl Street, Beaumont, Texas 77701.

The meeting will be held for discussion and approval of proposing a tax rate for tax year 2017 for Jefferson County, including; 1) determine the level of funding required to fund the proposed FY 2018 budget, 2) determine the level of the proposed tax rate for tax year 2017, 3) take a record vote of proposing a tax rate, and 4) schedule two public hearings on the proposed tax rate for Tuesday, September 5, 2017 at 1:30pm and Monday, September 11, 2017 at 1:30pm in the Commissioners Courtroom on the fourth floor of the Jefferson County Courthouse located at 1149 Pearl Street, Beaumont, Texas 77701.

Resolution

STATE OF TEXAS §
§
COUNTY OF JEFFERSON

COMMISSIONERS' COURT
OF JEFFERSON COUNTY, TEXAS

BE IT REMEMBERED at a meeting of Commissioners' Court of Jefferson County, Texas, held on the 14th day of August, 2017, on motion made by Michael S. Sinegal, Commissioner of Precinct No. 3, and seconded by Everette D. Alfred, Commissioner of Precinct No. 4, the following Resolution was adopted:

Jefferson County Sheriff's Office Rifle Resistant Body Armor Project

WHEREAS, The Jefferson County Commissioner's Court finds it in the best interest of the citizens of Jefferson County Texas, and the safety of those peace officers that serve them, that the Rifle-Resistant Body Armor Grant Program be operated from February 1, 2018 to January 31, 2019; and

WHEREAS, the Jefferson County Sheriff's Office and it's deputies are the primary responders to calls for assistance from the public, they execute arrest and search warrants for criminal offenses and they are members of the Jefferson County SWAT team that are the tactical response for high risk incidents; and,

WHEREAS, the County of Jefferson finds it in the best interest of the citizens of Jefferson County, that the Jefferson County Sheriff's Office's Rifle Resistant Body Armor Grant be applied for the period from February 1, 2018 to January 31, 2019; and,

WHEREAS, there is no requirement for matching funds for this grant; and,

WHEREAS, the County of Jefferson agrees that in the event of loss or misuse of the Criminal Justice Division funds, the County of Jefferson assures that the funds will be returned to the Criminal Justice Division in full.

WHEREAS, The Jefferson County Commissioner's Court designates The County Judge as the grantee's authorized official. The authorized official is given the power to apply for, accept, reject, alter or terminate the grant on behalf of the applicant agency.

NOW THEREFORE, BE IT RESOLVED that The Jefferson County Commissioner's Court approves submission of the grant application for the Jefferson County Sheriff's Office Rifle Resistant Body Armor project to the Office of the Governor.

SIGNED this 14th day of August, 2017.

Grant No.3441801

JUDGE JEFF BRANICK
COUNTY JUDGE

Eddie Arnold
Commissioner, Pct. 1

Michael S. Sinegal
Commissioner, Pct. 3

Brent A. Weaver
Commissioner, Pct. 2

Everette "Bo" Alfred
Commissioner, Pct. 4

AGENDA ITEM **August 14, 2017**

Receive and file executed Inter-local contract between Jefferson County Sheriff's Office and the City of Port Arthur, Texas for the purpose of maintaining a Multi-Agency Narcotics Enforcement Unit pursuant to Sec. 791.011, Texas Government Code.

JEFFERSON COUNTY SHERIFF'S OFFICE
SHERIFF ZENA STEPHENS

MEMORANDUM

DATE: 7/26/2017

TO: Honorable Judge Jeff Branick
Commissioner Eddie Arnold
Commissioner Brent Weaver
Commissioner Michael Sinegal
Commissioner Everette "Bo" Alfred

FROM: Major John Shauberger

RE: Interlocal Contract with the City of Pt. Arthur

Please consider and approve the attached interlocal contract with the City of Port Arthur, Texas. This interlocal contract is for the purpose of maintaining a multi-agency narcotics enforcement unit with the Jefferson County Sheriff's Office and the City of Port Arthur Police Department. Both agencies believe it to be in their best interests to maintain this multi-agency narcotics enforcement unit and for the best service to the citizens of Jefferson County.

Sincerely,

Major John Shauberger



P.R. No. 19792
5/17/17 gt

RESOLUTION NO. 17-136

A RESOLUTION AUTHORIZING THE CITY MANAGER TO EXECUTE AN INTERLOCAL CONTRACT BETWEEN THE CITY OF PORT ARTHUR AND THE JEFFERSON COUNTY SHERIFF'S OFFICE FOR THE PURPOSE OF MAINTAINING A MULTI-AGENCY NARCOTICS ENFORCEMENT UNIT

WHEREAS, pursuant to Chapter 791 of the Texas Government Code, the Port Arthur City Council desires to enter into an Interlocal Contract between the City of Port Arthur and the Jefferson County Sheriff's Office for the purpose of maintaining a multi-agency narcotics enforcement unit, attached as Exhibit "A".

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PORT ARTHUR, TEXAS:

Section 1. That the facts and opinions in the preamble are true and correct.

Section 2. That the City Council of the City of Port Arthur hereby authorizes the City Manager and the Chief of Police to execute an Interlocal Contract between the City of Port Arthur and the Jefferson County Sheriff's Department, in order to maintain a multi-agency narcotics enforcement unit, in substantially the same form as attached hereto as Exhibit "A".

Section 3. That a copy of the Resolution be spread upon the minutes of the City Council.

READ, ADOPTED, AND APPROVED on this the 23rd day of May, 2017, at a regular meeting of the City council of the City of Port Arthur, Texas, by the following votes:

AYES:

Mayor: Freeman; Mayor Pro Tem Jones,

Councilmembers: Scott, Kinlaw, Deuat, Lewis, Swati, Moses and Frank.,

;

NOES: None.

Derrick Ford Freeman
Mayor

ATTEST:

Sherri Bellard
City Secretary

APPROVED AS TO FORM:

Val Tizeno
City Attorney

APPROVED FOR ADMINISTRATION:

Brian McDougal
City Manager

EXHIBIT "A"

Jefferson Co. Narcotics Task Force PR 19792

2003

DUPLICATE ORIGINAL CONTRACT FOR

RES/ORD 17-136

PLEASE EXECUTE AND RETURN TO THE CITY SECRETARY'S OFFICE

COUNCIL MEETING DATE: May 23, 2017

INTERAGENCY AGREEMENT

JEFFERSON COUNTY NARCOTICS TASK FORCE

STATE OF TEXAS

COUNTY OF JEFFERSON

This Interlocal Contract **(Contract)** is entered into by and between the Jefferson County Sheriff's Office, hereinafter referred to as **JCSO,** and the Port Arthur Police Department, hereinafter called **PAPD,** a municipal police department situated in Jefferson County, Texas. This agreement is pursuant to Chapter 791 of the Texas Government Code, concerning interlocal cooperation contracts. The Contract is being approved by Jefferson County, a political subdivision of the State of Texas, and the City of Port Arthur, a municipal corporation situated in Jefferson County, Texas, in order to establish the responsibility for liability for law enforcement services and effectuate insurance coverage and offer provisions that normally fall within other authority.

WITNESSETH

WHEREAS, JCSO, and **PAPD** believe it to be in their best interest to maintain a multi-agency, narcotics enforcement unit, herein after referred to as the **TASK FORCE.**

NOW, THERE FORE, IT IS HEREBY AGREED AS FOLLOWS:

ARTICLE I

TERM

1.01 The term of this Agreement is to commence on the execution of this Agreement and end on December 31, 2020.

ARTICLE II

CONSIDERTATION

2.01 As consideration for this Agreement, **JCSO** will provide office space and related expenses (utilities, phone service, office supplies) for narcotics investigator assigned to the task force by **PAPD**. The investigator shall at all times remain an employee of their **CITY** and respective agencies. Investigators of the **JCSO** assigned to the Task Force, shall at all times remain as employees of the **COUNTY** and the **JCSO.**

2.02 All asset forfeitures resulting from narcotics operations of this Task Force will be awarded to the **JCSO**. On December 1 of each year, the **JCSO** will asset share a percentage of seizures awarded during the previous year to **PAPD**. This amount will be determined by a percentage based on a calculation, of the total number of narcotic investigators assigned to the Task Force. Other agencies may join the Task Force, which would change the calculations.

ARTICLE III

LEAD AGENCY

3.01 Sheriff Zena Stephens shall designate a staff officer to serve as Commander/Project Coordinator for the Task Force, who shall be authorized to establish rules, regulations, and directives for the effective operation of the Task Force.

ARTICLE IV

ASSURANCES

4.01 The **Parties** to this **Agreement** are governed by the Texas Tort Claims Act,

Chapter 101.001 et.seq., Civil Practice and Remedies Code. The **Parties** warrant and represent to each other that they are self-insured or commercially insured for all claims falling within the Texas Tort Claims Act. The **Parties** do not intend to waive immunity or any protection afforded them, individually or collectively, under the law.

4.02 The **COUNTY** and **JCSO** agree that the **CITY** and/or **PAPD** shall have no liability whatsoever for the acts or omissions of an individual employed by the **COUNTY** and/or **JCSO** regardless of where the individual's actions occurred. **PAPD** agrees that the **COUNTY** and/or **JCSO** shall have no liability for acts or omissions of an individual employed by **PAPD** regardless of where the individual's actions occurred. Each party is solely responsible for the action and/or omission of its employees and officers.

4.03 Each Party will assume all liability arising from the operation of Task Force vehicles by its employees. Each Party assumes no liability for any employees other than its own.

4.04 The forfeited vehicles operated by the Task Force are not commercially insured. Each Party to the Agreement agrees to assume liability for the operation of these vehicles by its officers and employees.

ARTICLE V

AMENDMENTS

5.01 This Agreement may only be amended by the mutual agreement of the Parties hereto in Writing to be attached to and incorporated into this Agreement.

ARTICLE VI

LEGAL CONSTRUCTION

6.01 In case any one or more of the provisions contained in this Agreement shall be held to be invalid, illegal or unenforceable in any respect, such an invalidity, or unenforceability shall not affect any other provision thereof, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

ARTICLE VII

ENTIRE AGREEMENT

7.01 This Agreement supersedes any and all other agreements, either oral or in writing between the Parties hereto with respect to the subject matter hereof, and no other agreement or statement relating to the subject matter of this Agreement which is not contained herein shall be valid or binding.

EXECUTED IN DUPLICATE ORIGINALS, EACH OF WHCH SHALL HAVE THE FULL FORCE AND EFFECT OF AN ORIGINAL, ON THIS THE 7th DAY OF August, 2017.

FOR JEFFERSON COUNTY

Zena Stephens, Sheriff/Project Director

Jeff Branick, County Judge

FOR THE CITY OF PORT ARTHUR

Patrick Melvin, Chief of Police

Brian McDougal , City Manager

Regular, August 14, 2017

There being no further business to come before the Court at this time, same is now here adjourned on this date, August 14, 2017