JEFFERSON COUNTY PURCHASING DEPARTMENT

Deborah L. Clark, Purchasing Agent

1149 Pearl Street
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LEGAL NOTICE
Advertisement for Invitation for Bids
October 8, 2024

Notice is hereby given that sealed bids will be accepted by the Jefferson County Purchasing Department for Invitation for Bid **(IFB 24-062/MR) Jefferson County Diversion Center Renovation, pursuant to Chapter 262, Texas Local Government Code, the County Purchasing Act and 2 CFR Sections 200.318-326.** Specifications for this project may be obtained from the Jefferson County website, https://www.co.jefferson.tx.us/Purchasing/ or by calling 409-835-8593.

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 two (2) copies of their bid to the address shown below. Jefferson County does not accept bids submitted electronically. Late bids will be rejected as non-responsive. Bids will be publicly opened and read aloud in the Jefferson County Engineering Department Conference Room (5th Floor, Historic Courthouse) 1149 Pearl Street, Beaumont, Texas 77701, at the time and date below. Bidders are invited to attend the sealed bid opening.

BID NAME:	**Jefferson County Diversion Center Renovation, pursuant to Chapter 262, Texas Local Government Code, the County Purchasing Act and 2 CFR Sections 200.318-326.**
BID NUMBER:	**IFB 24-062/MR**
DUE BY TIME/DATE:	**11:00 AM CT, Wednesday, November 13, 2024**
MAIL OR DELIVER TO:	**Jefferson County Purchasing Department** **1149 Pearl Street, 1st Floor** **Beaumont, Texas 77701**

There will be a **Mandatory Pre-Bid Conference and Walk-Through** at **10:00 AM CT on Thursday**, **October 17, 2024**, at the Diversion Center Site Location at 3890 FM 3514, Beaumont, Texas 77705.

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 contract execution and prior to the issuance of Notice to Proceed and/or Purchase Order, the Bidder shall furnish the following bonds: Performance Bond to the County for the full amount of the contract if the contract exceeds one hundred thousand dollars ($100,000). Payment Bond to the County for the full amount of the contract if the contract exceeds twenty-five thousand dollars ($25,000.00).

Any questions relating to these bid requirements should be directed to Mistey Reeves, Assistant Purchasing Agent at 409-835-8593 or via email at: mistey.reeves@jeffcotx.us. If no response in 72 hours, contact Deborah Clark, Purchasing Agent at 409-835-8593 or via email at: deb.clark@jeffcotx.us.

Jefferson County encourages Disadvantaged Business Enterprises (DBEs), Minority/Women Business Enterprises (M/WBEs), and Historically Underutilized Businesses (HUBs) 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 least seven (7) days prior to the bid due date at 409-835-8593.

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

Bidders are strongly encouraged to carefully read the entire invitation, as failure to return and/or complete all required documentation will result in a response being declared as non-responsive.

Deborah L. Clark, Purchasing Agent
Jefferson County, Texas

PUBLISH:
Beaumont Enterprise & Port Arthur News:
October 9, 2024 & October 16, 2024
The Examiner:
October 10. 2024

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BID SUBMISSIONS:

One (1) Original and two (2) Bid Copies; with all copies to include a Completed Copy of this specifications packet (including technical specifications), in its entirety.
Each Bidder shall ensure that required parts of their bid submission are completed with accuracy and submitted as per the requirements within this specifications packet, including any addenda.
Additionally, Bidder shall monitor the Jefferson County Purchasing Department Website for any addenda, additional instructions, or bid updates. https://www.co.jefferson.tx.us/Purchasing/
Failure to return and/or complete all required documentation will result in a response being declared as non-responsive.

SECTION 1: 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 BID PRIOR TO 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 BID AFTER 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 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 CONFIDENTIAL/PROPRIETARY INFORMATION.

If any material in the bid submission is considered by Bidder to be confidential or proprietary information (including manufacturing and/or design processes exclusive to the Bidder), Bidder **must** clearly mark the applicable pages of bid submission to indicate each claim of confidentiality. Additionally, Bidder must include a statement on company letterhead identifying all Bid Submission section(s) and page(s) that have been marked as confidential. Jefferson County will protect from public disclosure such portions of a bid, unless directed otherwise by legal authority, including existing open records acts. Merely making a blanket claim that the entire bid submission is protected from disclosure because it contains some proprietary information is not acceptable, and will make the entire bid submission subject to release under the Texas Public Information Act.

By submitting a bid, Bidder agrees to reproduction by Jefferson County, without cost or liability, of any copyrighted portions of Bidder's bid submission or other information submitted by Bidder.

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 office working hours of 8:00 am CT to 4:00 pm CT, 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 services 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-DETERIMINATION.

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 INTEREST BY PUBLIC OFFICIALS.

No public official shall have interest in this contract, in accordance with Texas Local Government Code.

4.7 PRE-AWARD/CONTRACT CONTACT BETWEEN COUNTY AND VENDORS.

The Jefferson County Purchasing Department may initiate discussions with selected vendors; however, discussions may not be initiated by vendors.

The Jefferson County Purchasing Department expects to conduct discussions with vendor's representatives authorized to contractually obligate the vendor with an offer.

Vendors shall not contact any Jefferson County personnel during the IFB process without the express permission from the Jefferson County Purchasing Agent. The Purchasing Agent will disqualify any vendor who has made site visits, contacted Jefferson County personnel, or distributed any literature without authorization from the Jefferson County Purchasing Department.

All correspondence relating to this IFB, from advertisement to award shall be sent to the Jefferson County Purchasing Department. All presentations and/or meetings between Jefferson County and the vendor relating to this IFB shall be coordinated by the Jefferson County Purchasing Department.

Selected vendors may be expected to make a presentation/product demonstration to an Evaluation Committee. Proposals, vendor presentations, and product/service evaluations may develop into negotiating sessions with the

vendor(s) as selected by the Evaluation Committee. Jefferson County expects to conduct negotiations with vendor representatives authorized to contractually obligate the vendor with an offer. If vendor is unable to agree to contract terms and conditions, Jefferson County reserves the right to terminate contract negotiations with that vendor and initiate negotiations with another vendor. In addition to a presentation, visits by the Evaluation Committee to representative vendor client sites may be conducted where the proposed solution can be demonstrated in a production environment.

4.8 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.

4.9 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.

4.10 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.

4.11 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.

4.12 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.

4.13 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.

5. 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.

6. 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.

7. 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 non-conformity 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.

8. 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.

9. 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.

10. 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.

11. 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 at https://www.co.jefferson.tx.us/Purchasing/ 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.

12. 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.

13. 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.

14. 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.

15. INTERPRETATION OF BID AN/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.

16. CURRENCY.

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

17. 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.

18. NOTICE TO PROCEED/PURCHASE ORDER.

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

19. 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.

20. DEFINITIONS.

"County" – Jefferson County, Texas.
"Contractor" – The Bidder whose proposal is accepted by Jefferson County.

21. SMALL, MINORITY & WOMEN BUSINESS ENTERPRISE PARTICIPATION

It is the desire of Jefferson County to increase the participation of Small, 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.

Minority owned business may be eligible for contract procurement assistance with public and private sector entities from MBDA Centers

Dallas Fort Worth MBDA Business Center
8828 N. Stemmons Freeway, Ste. 550 B
Dallas, TX 75247
214-920-2436
Website: https://www.mbdadfw.com
Email: admin1@mbdadallas.com

El Paso MBDA Business Center
2401 East Missouri Avenue
El Paso, TX 79903
915-351-6232
Website: https://www.mbda.gov/business-center/el-paso-mbda-business-center
Email: treed@ephcc.org

Houston MBDA Business Center
3100 Main Street, Ste. 701
Houston, TX 77002
713-718-8974
Website: https://www.mbda.gov/business-center/houston-mbda-business-center
Email: mbda@hccs.edu

San Antonio MBDA Business Center
501 W. Cesar E. Chavez Blvd., Ste. 3.324 B
San Antonio, TX 78207
210-458-2480
Website: https://www.mbda.gov/business-center/san-antonio-mbda-business-center
Email: Jacqueline.jackson@utsa.edu

Small and woman-owned business may be eligible for assistance from U.S. Small Business Administration (SBA):
Website: https://www.sba.gov/local-assistance

Dallas/Fort Worth District Office
150 West Parkway, Ste. 130
Euless, TX 76040
817-684-5500
Website: https://www.sba.gov/district/dallas-fort-worth
Email: dfwdo.email@sba.gov

El Paso District Office
211 N. Florence St, Ste. 201
El Paso, TX 79901
915-834-4600
Website: https://www.sba.gov/district/el-paso
Email: Suzanne.aguirre@sba.gov

Houston District Office
8701 S. Gessner Dr, Ste. 1200
Houston, TX 77074
713-773-6500
Website: https://www.sba.gov/district/houston
Email: houston@sba.gov

Lower Rio Grande Valley District Office
2422 E. Tyler Ave, Suite E
Harlingen, TX 78550
956-427-8533
Website: https://www.sba.gov/district/lower-rio-grande-valley
Email: lrgvdo.email@sba.gov

San Antonio District Office
615 E. Houston St, Ste 298
San Antonio, TX 78205
210-403-5900
Website: https://www.sba.gov/district/san-antonio
Email: sado.email@sba.gov

West Texas District Office
1205 Texas Ave, Room 408
Lubbock, TX 79401
806-472-7462
Website: https://www.sba.gov/district/west-texas
Email: lubdo@sba.gov

HUB certification information can be found at:

Statewide Procurement Division HUB Program
P.O. Box 13528
Austin, TX 78711
512-463-5872 or 888-863-5881
Website: https://comptroller.texas.gov/purchasing/vendor/hub
Email: statewidehubprogram@cpa.texas.gov

PROPOSER: INSERT HUB, SBE, MBE or WBE Certification behind this page.

SECTION 2: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) MANDATED CONTRACT PROVISIONS FOR NON-FEDERAL ENTITY UNDER FEDERAL AWARDS REQUIRED BY 2 C.F.R. §200.326 APPENDIX II TO 2 CFR §200

2 CFR 200.327 Contract provisions. The non-Federal entity's contracts should contain applicable provisions described in Appendix II to Part 200—Contract Provisions for non-Federal Entity Contracts Under Federal Awards. The non-Federal entity's contracts must contain the provisions described in Appendix II to Part 200—Contract Provisions for non-Federal Entity Contracts Under Federal Awards, as applicable. ***Language as of August 31, 2022.**

THRESHOLD	PROVISION	CITATION
>$250,000 (Simplified Acquisition Threshold)	Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where Contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.	2 CFR 200 APPENDIX II (A)
>$10,000	All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement.	2 CFR 200 APPENDIX II (B)
None	Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor." 41 CFR 60-1.4 Equal opportunity clause. (b) Federally assisted construction contracts. (1) Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause: The [recipient] hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following 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, sexual orientation, gender identity, 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, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:	2 CFR 200 APPENDIX II I and 41 CFR §60-1.4(b)

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 consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

(4) 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.

(5) 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.

(6) 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.

(7) 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. (8) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) 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. The [recipient] further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the [recipient] so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract. The [recipient] agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of Contractors and Subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance. The [recipient] further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon Contractors and Subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the [recipient] agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the [recipient] under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such [recipient]; and refer the case to the Department of Justice for appropriate legal proceedings.	
>$2,000	Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, “Labor Standards Provisions	2 CFR 200 APPENDIX II (D)

	Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, Contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, Contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each Contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.	
>$100,000	Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each Contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.	2 CFR 200 APPENDIX II (E)
None	Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR § 401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.	2 CFR 200 APPENDIX II (F)
>$150,000	Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended - Contracts and subgrants of amounts in excess of $150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).	2 CFR 200 APPENDIX II (G)

>$25,000	Debarment and Suspension (Executive Orders 12549 and 12689) - A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.	2 CFR 200 APPENDIX II (H)
>$100,000	Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) - Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.	2 CFR 200 APPENDIX II (I) and 24 CFR §570.303
	See 2 CFR §200.323.	2 CFR 200 APPENDIX II (J)
	See 2 CFR §200.216.	2 CFR 200 APPENDIX II (K)
	See 2 CFR §200.322.	2 CFR 200 APPENDIX II (L)
>$10,000	A non-Federal entity that is a state agency or agency of a political subdivision of a state and its Contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.	2 CFR 200.323
>$100,000	*§135.38 Section 3 clause* *All section 3 covered contracts shall include the following clause (referred to as the section 3 clause):* A. The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing. B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.	

	C. The Contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the Contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin. D. The Contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the Subcontractor is in violation of the regulations in 24 CFR part 135. The Contractor will not subcontract with any Subcontractor where the Contractor has notice or knowledge that the Subcontractor has been found in violation of the regulations in 24 CFR part 135. E. The Contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the Contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the Contractor's obligations under 24 CFR part 135. F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts. G. With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).	
None	Section 889(b)(1) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY2019 NDAA) and 2 C.F.R. § 200.216, as implemented by FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), prohibit the obligation or expending of federal award funds on certain telecommunication products or from certain entities for national security reasons. Effective August 13, 2020, FEMA recipients and subrecipients, as well as their Contractors and Subcontractors, may not obligate or expend any FEMA award funds to: Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to: (1) Procure or obtain; (2) Extend or renew a contract to procure or obtain; or (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered	2 CFR 200.216

	telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). (i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities). (ii) Telecommunications or video surveillance services provided by such entities or using such equipment. (iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country. (b) In implementing the prohibition under Public Law 115-232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained. (c) See Public Law 115-232, section 889 for additional information. (d) See also § 200.471.	
None	As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of this section: (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.	2 CFR 200.322(a)(b)(1)(2)
None	The Federal awarding agency must establish conflict of interest policies for Federal awards. The non-Federal entity must disclose in writing any potential conflict of interest to the Federal awarding agency or pass-through entity in accordance with applicable Federal awarding agency policy.	2 CFR 200.112

None	The Federal awarding agency and the non-Federal entity should, whenever practicable, collect, transmit, and store Federal award-related information in open and machine-readable formats rather than in closed formats or on paper in accordance with applicable legislative requirements. A machine-readable format is a format in a standard computer language (not English text) that can be read automatically by a web browser or computer system. The Federal awarding agency or pass-through entity must always provide or accept paper versions of Federal award-related information to and from the non-Federal entity upon request. If paper copies are submitted, the Federal awarding agency or pass-through entity must not require more than an original and two copies. When original records are electronic and cannot be altered, there is no need to create and retain paper copies. When original records are paper, electronic versions may be substituted through the use of duplication or other forms of electronic media provided that they are subject to periodic quality control reviews, provide reasonable safeguards against alteration, and remain readable.	2 CFR 200.336
None	Contracting with HUB, small and minority businesses, women's business enterprises, and labor surplus area firms. (a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. (b) Affirmative steps must include: (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists; (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources; (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises; (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and (6) Requiring the prime Contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (b)(1) through (5) of this section.	2 CFR 200.321
None	Financial records, supporting documents, statistical records, and all other non-Federal entity records pertinent to a Federal award must be retained for a period of three years from the date of submission of the final expenditure report or, for Federal awards that are renewed quarterly or annually, from the date of the submission of the quarterly or annual financial report, respectively, as reported to the Federal awarding agency or pass-through entity in the case of a subrecipient. Federal awarding agencies and pass-through entities must not impose any other record retention requirements upon non-Federal entities. The only exceptions are the following: (a) If any litigation, claim, or audit is started before the expiration of the 3-year period, the records must be retained until all litigation, claims, or audit findings involving the records have been resolved and final action taken. (b) When the non-Federal entity is notified in writing by the Federal awarding agency, cognizant agency for audit, oversight agency for audit, cognizant agency for indirect costs, or pass-through entity to extend the retention period. (c) Records for real property and equipment acquired with Federal funds must be retained for 3 years after final disposition.	2 CFR 200.334

	(d) When records are transferred to or maintained by the Federal awarding agency or pass-through entity, the 3-year retention requirement is not applicable to the non-Federal entity. (e) Records for program income transactions after the period of performance. In some cases, recipients must report program income after the period of performance. Where there is such a requirement, the retention period for the records pertaining to the earning of the program income starts from the end of the non-Federal entity's fiscal year in which the program income is earned. (f) Indirect cost rate proposals and cost allocations plans. This paragraph applies to the following types of documents and their supporting records: Indirect cost rate computations or proposals, cost allocation plans, and any similar accounting computations of the rate at which a particular group of costs is chargeable (such as computer usage chargeback rates or composite fringe benefit rates). (1) *If submitted for negotiation.* If the proposal, plan, or other computation is required to be submitted to the Federal Government (or to the pass-through entity) to form the basis for negotiation of the rate, then the 3-year retention period for its supporting records starts from the date of such submission. (2) *If not submitted for negotiation.* If the proposal, plan, or other computation is not required to be submitted to the Federal Government (or to the pass-through entity) for negotiation purposes, then the 3-year retention period for the proposal, plan, or computation and its supporting records starts from the end of the fiscal year (or other accounting period) covered by the proposal, plan, or other computation.	
None	CONTRACTS WITH COMPANIES ENGAGED IN BUSINESS WITH IRAN, SUDAN, OR FOREIGN TERRORIST ORGANIZATION PROHIBITED. A governmental entity may not enter into a governmental contract with a company that is identified on a list prepared and maintained under Section 2270.0052, 2270.0102, or 2270.0152. In accordance with Texas Government Code, Chapter 2252, Subchapter F, **Respondent** hereby represents and warrants that it is not a company identified on the lists prepared and maintained under Texas Government Code §§ 2270.0052 (companies with business operations in Sudan), 2270.0102 (companies with business operations in Iran), or 2270.0152 (companies known to have contracts with or provide supplies or services to a foreign terrorist organization). Notwithstanding the foregoing, a company that the United States government affirmatively declares to be excluded from its federal sanctions regime relating to Sudan, Iran, or to a foreign terrorist organization, is not subject to contract prohibition under this clause. A company claiming such exemption must submit the official copy of the declaration.	Texas Government Code 2252.152
>$100,000	PROVISION REQUIRED IN CONTRACT. (a) This section applies only to certain solicitations and contracts. Section 2271.002 of the Texas Government Code states the following: (a) This section applies only to a contract that: (1) is between a governmental entity and a company with 10 or more full-time employees; and (2) has a value of $100,000 or more that is to be paid wholly or partly from public funds of the governmental entity. (b) A governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it:	Texas Government Code 2271.002

	(1) does not boycott Israel; and (2) will not boycott Israel during the term of the contract. Section 2271.001(2) of the Government Code defines “company" to be the meaning assigned by Section 808.001 of the Texas Government Code, except that the term does not include a sole proprietorship.	
Option Contract Language for contracts awarded prior to Grant Award	The contract award is contingent upon the receipt of federal funds. If no such funds are awarded, the contract shall terminate.	Optional
	Mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.	42 U.S.C. 6201
	The Firm agrees that no otherwise qualified individual with disabilities shall, solely by reason of his/her disability, be denied the benefits of, or be subjected to discrimination, including discrimination in employment, under any program or activity receiving federal financial assistance.	Section 504 of the Rehabilitation Act of 1973, as amended.

BYRD ANTI-LOBBYING CERTIFICATION

Certification for Contracts, Grants, Loans, and Cooperative Agreements-The undersigned certifies, 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 undersigned, 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.

3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

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.

The Contractor_____ certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C.Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

_____

Signature of Contractor's Authorized Official

_____

Name and Title of Contractor's Authorized Official

_____

Date

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

DEBARMENT/SUSPENSION CERTIFICATION

Non-Federal entities and Contractors are subject to the debarment and suspension regulations implementing Executive Order 12549, Debarment and Suspension (1986) and Executive Order 12689, Debarment and Suspension (1989) at 2 C.F.R. Part 180 and the Department of Homeland Security's regulations at 2 C.F.R. Part 3000 (No procurement Debarment and Suspension).

This requirement applies to all FEMA grant and cooperative agreement programs.

Federal Executive Order (E .O.) 12549 "Debarment" requires that all Contractors receiving individual awards, using federal funds, and all sub recipients certify that the organization and its principals are not debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency from doing business with the Federal Government. By signing this document, you certify that your organization and its principals are not debarred. Failure to comply or attempts to edit this language may disqualify your bid. Information on debarment is available at the following websites: www.sam.gov and https://acguisition.qov/far/index.html see section 52.209-6.

The Contractor _____ certifies or affirms by your signature that neither you nor your principal is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

_____

Signature of Contractor's Authorized Official

_____

Name and Title of Contractor's Authorized Official

_____

Date

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

1. EQUAL EMPLOYMENT OPPORTUNITY (Equal Opportunity Clause)

(For all awarded contracts that meet the definition of "federally assisted construction contract" provided in 41 CFR Part 60-1.3)

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, sexual orientation, gender identity, 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, sexual orientation, gender identity, 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 consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

3) The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

4) 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.

5) 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.

6) 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.

7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or order 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.

8) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) 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.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of Contractors and Subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon Contractors and Subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

_____

Signature of Contractor's Authorized Official

_____

Name and Title of Contractor's Authorized Official

_____

Date

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

SECTION 3: SPECIAL REQUIREMENTS/BID SUBMISSION INSTRUCTIONS

The following requirements and instructions **supersede** General Requirements where applicable.

1. SUBMISSION OF BID.

Bidder is Responsible for Submitting:

One (1) Original and two (2) Bid Copies; with all copies to include a Completed Copy of this Specifications Packet (including technical specifications), **in its entirety.**

The County requests that bid submissions NOT be bound by staples or glued spines.

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

Additionally, Bidder shall monitor the Jefferson County Purchasing Department Website for any addenda, additional instructions, or bid updates. https://www.co.jefferson.tx.us/Purchasing/

Failure to return and/or complete all required documentation will result in a response being declared as non-responsive.

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

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

All submissions must be received by 11:00 am CT, Wednesday, November 13, 2024.

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.

Jefferson County will not accept any responsibility for bids being delivered by third party carriers.

Late bids will not be accepted and will be returned unopened to the Bidder.
Jefferson County shall not be responsible for any effort or cost expended in the preparation of a response to this IFB.

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

All protests should be coordinated through the Purchasing Office prior to award recommendation to Commissioners' Court.

COURTHOUSE SECURITY: All visitors to the Courthouse must pass through Security. Respondents planning to hand deliver proposals 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.

In response to the Covid-19 pandemic, Jefferson County has implemented precautionary measures as currently recommended by the CDC within its facilities. Bidders are strongly urged to plan accordingly.

COUNTY HOLIDAYS (2024):

January 15	(Monday)	Martin Luther King, Jr. Day
March 29	(Friday)	Good Friday
May 27	(Monday)	Memorial Day
June 19	(Wednesday)	Juneteenth
July 4	(Thursday)	Independence Day
September 2	(Monday)	Labor Day
November 11	(Monday)	Veteran's Day
November 28 & 29	(Thursday & Friday)	Thanksgiving
December 25 & 26	(Wednesday & Thursday)	Christmas
January 1, 2025	(Wednesday)	New Year's

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 IFB 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 Statements of Qualifications 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.

2. PRE-BID MEETING AND WALK-THROUGH.

There will be a Mandatory Pre-Bid Meeting and Walk-Through on Thursday, October 17, 2024, at 10:00 am CT, at the Diversion Center Site Location at 3890 FM 3514, Beaumont, Texas 77705.

3. QUESTIONS/DEADLINE FOR QUESTIONS.

Questions may be emailed to **Mistey Reeves, Assistant Purchasing Agent** at: mistey.reeves@jeffcotx.us. If no response in 72 hours, contact **Deborah Clark, Purchasing Agent** at: deb.clark@jeffcotx.us. The Deadline for asking questions or requesting additional information (in writing) is 5:00 pm, CT, Wednesday, October 30, 2024**.**

4. VENDOR REGISTRATION (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

In instances where a vendor has either an "Inactive" SAM Registration or is not currently registered with the System for Award Management, the Purchasing Department may *initially* accept proof (printout from the SAM website) that the vendor has begun the registration process in order for the IFB/RFQ/RFP submission to be considered as "responsive" to the specifications for the project.

However, the SAM Registration must be completed (showing "active" status, with no exclusions) prior to the award and/or execution of an agreement or contract for the project.

BIDDER: INSERT PROOF OF SYSTEM FOR AWARD MANAGEMENT (SAM) BEHIND THIS PAGE.

5. FORM 1295 (Texas Ethics Commission) SUBMISSSION REQUIREMENT/INSTRUCTIONS FOR BIDDERS.
All Non-Exempt Bidders are required to submit a completed FORM 1295 with bid submission.

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

2. Submit a FORM 1295 hard copy (completed & signed by an Authorized Agent of the Awarded Vendor), to the Jefferson County Purchasing Department **with bid submission.**

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

A sample of a completed FORM 1295 is included on **PAGE 32**.

FORM 1295 Implementation Background:
In accordance with House Bill 1295 (passed January 1, 2016), Vendors entering into contracts and professional agreements with Jefferson County will be required to complete a Certificate of Interested Parties (FORM 1295), **unless contract is considered exempt as described below.**

In 2017, the Texas legislature amended the law to require Form 1295 to include an "unsworn declaration" which includes, among other things, the date of birth and address of the authorized representative signing the form. The unsworn declaration, including the date of birth and address of the signatory, replaces the notary requirement that applied to contracts entered into before January 1, 2018. The TEC filing application does not capture the date of birth or street address of the signatory and it will not appear on forms that are filed using the TEC filing application.

Changes to the law requiring certain businesses to file a Form 1295 are in effect for contracts entered into or amended on or after January 1, 2018. The changes exempt businesses from filing a Form 1295 for certain types of contracts and replace the need for a completed Form 1295 to be notarized. Instead, the person filing a 1295 needs to complete an "unsworn declaration."

Question: Will the date of birth and address provided appear on the TEC's website when the form is filed?

Answer: No. The TEC filing application does not capture the date of birth or street address of the signatory and it will not appear on forms that are filed using the TEC filing application. Although the TEC does not capture the date of birth and street address of the signatory, the contracting state agency or governmental agency will have a physical copy of the form that includes the date of birth and address of the signatory. The TEC cannot answer whether the contracting state agency or governmental agency may release such information. Questions regarding the Texas Public Information Act may be directed to the Office of the Attorney General. See also Paxton v. City of Dall., No. 03-13-00546-CV, 2015 Tex. App. LEXIS 5228, at *10-11 (App.—Austin May 22, 2015) (mem. op.) (pet. denied) (available here)

FORM 1295 EXEMPTIONS:
What type of contracts are exempt from the Form 1295 filing requirement under the amended law?
The amended law adds to the list of types of contract exempt from the Form 1295 filing requirement.

A completed Form 1295 is not required for:
- a sponsored research contract of an institution of higher education
- an interagency contract of a state agency or an institution of higher education
- a contract related to health and human services if: the value of the contract cannot be determined at the time the contract is executed; and any qualified vendor is eligible for the contract
- a contract with a publicly traded business entity, including a wholly owned subsidiary of the business entity
- a contract with an electric utility, as that term is defined by Section 31.002, Utilities Code
- a contract with a gas utility, as that term is defined by Section 121.001, Utilities Code

SAMPLE COMPLETED FORM 1295

VENDOR: FORM 1295 MUST BE COMPLETED/SUBMITTED ON TEXAS ETHICS COMMISSION WEBSITE. HARD COPY OF FORM 1295 IS TO BE PRINTED, COMPLETED, SIGNED, AND SUBMITTED WITH BID/PROPOSAL/AGREEMENT/CONTRACT.

JEFFERSON COUNTY WILL CONFIRM RECEIPT OF COMPLETED HARD COPY WITH THE TEXAS ETHICS COMMISSION.

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

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

VENDOR:ENTER YOUR BUSINESS NAME, CITY, STATE, AND COUNTRY HERE

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

JEFFERSON COUNTY, TEXAS

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.

VENDOR: ENTER BID/PROPOSAL/CONTRACT/AGREEMENT REF# AND TITLE HERE.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary
VENDOR: ENTER EACH PERSON HAVING INTEREST, OWNERS ARE THE CONTROLLING PARTIES.		X	
VENDOR: WORKERS (OR NON-OWNERS) IN YOUR COMPANY ARE INTERMEDIARY PARTIES.			X

5 Check only if there is NO Interested Party. CHECK BELOW IF APPLICABLE ☐

6 UNSWORN DECLARATION VENDOR: COMPLETE, DATE, AND SIGN THIS DECLARATION SECTION.

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____ , on the _____ day of _____, 20_____.
(month) (year)

_____
Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 12/22/2017

NOTE: JEFFERSON COUNTY WILL KEEP A COPY OF THIS FORM ON FILE FOR EACH BID/PROPOSAL/CONTRACT/AGREEMENT AND EACH VENDOR RESPONDING TO BIDS/PROPOSALS.

Must file online at www.ethics.state.tx.us/File

BIDDER: INSERT COMPLETED FORM 1295 BEHIND THIS PAGE.

6. MULTIPLE VENDOR AWARD.

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

7. 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.

8. 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.

9. 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.

10. INSURANCE.

The Contractor (including any and all Subcontractors as defined in Section 11.1.3 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 Section 9 Below)

11. WORKERS' COMPENSATION INSURANCE

11.1 Definitions:

11.1.1 **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.

11.1.2 **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.

11.1.3 **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.

11.2 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.

11.3 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract – **refer to Section 10 above**.

11.4 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.

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

11.5.1 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

11.5.2 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.

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

11.7 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.

11.8 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.

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

11.9.1 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.

11.9.2 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.

11.9.3 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.

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

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

11.9.4.2 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.

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

11.9.6 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

11.9.7 Contractually require each person with whom it contracts to perform as required by paragraphs **11.1. – 11.7**., with the certificates of coverage to be provided to the person for whom they are providing services.

11.10 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.

11.11 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.

<u>BIDDER</u>: INSERT COPY OF CERTIFICATE OF INSURANCE (COI) BEHIND THIS PAGE.

Note: For bid purposes, a general COI will suffice. However, a COI that includes the notation that "Jefferson County as an additional insured" will be required from Awarded Bidder(s) prior to the issuance of a Purchase Order.

BIDDER INFORMATION FORM

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

Bid Number & Name: (IFB 24-062MR) Jefferson County Diversion Center Remodel

Bidder's Company/Business Name: _____

Bidder's TAX ID Number: _____

If Applicable: **HUB Vendor No**. _____ **DBE Vendor No**. _____

Contact Person: _____ **Title:** _____

Phone Number (with area code): _____

Alternate Phone Number if available (with area code):_____

Fax Number (with area code):_____

Email Address: _____

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

_____
Address

_____
City, State, Zip Code

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

SECTION 4: MINIMUM SPECIFICATIONS

The following requirements and specifications supersede General Bid Requirements where applicable. Any questions relating to bid submission or bid item specifications requirements should be directed to Mistey Reeves, Assistant Purchasing Agent at 409-835-8593 or via email at: mistey.reeves@jeffcotx.us. If no response in 72 hours, contact Deborah Clark, Purchasing Agent at 409-835-8593 or via email at: deb.clark@jeffcotx.us. Please reference Bid Number: IFB 24-062/MR.

SCOPE OF PROJECT:

Jefferson County is soliciting bids for the renovation of the Jefferson County Diversion Center. This building is currently designed for juvenile detention and will be converted to voluntary diversion center to help people with a mental health diagnosis get help without going to jail. The project consists of mold remediation as well as interior demolition and renovation of approximately 18,426 square feet of floor space. This project also includes new driveway construction. The scope of this project includes construction materials and work including, but not limited to:

- Mold Remediation
- Demolition
- Structural Steel
- Concrete
- Metal Framing
- Rough and Finish Carpentry
- Architectural Casework
- Finishes
- Specialties
- Plumbing
- Electrical
- HVAC
- Fire Suppression

TERMS:

The awarded contractor is responsible for all permits, license and fees associated with the project. Any changes to the Project Plans must be approved by Jefferson County Commissioners' Court and the Project Architect Brave Architecture.

MOLD REMEDIATION PROTOCOL:

The Mold Remediation Protocol for this project may be found starting on page 61 of this Invitation for Bid.

PROJECT MANUAL & DRAWINGS:

The Project Manual and Drawings for this project may be found starting on page 71 of this Invitation for Bid.

BID FORM:

The Bid Form for this project is on page 44 of this Invitation for Bid.

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): _____, _____, _____, _____.

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

Company Name

Address

City State Zip

Signature of Person Authorized to Sign

Printed Name

Title

For clarification of this offer, contact:

Name & Title

Phone Fax

E-mail

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

ACCEPTANCE OF OFFER

The Offer is hereby accepted for the following items: Jefferson County Diversion Center Remodel.

The Contractor is now bound to sell the materials or services listed by the attached contract and based upon the Invitation for Bid, including all terms, conditions, specifications, amendments, etc., and the Contractor's Offer as accepted by Jefferson County.

This contract shall henceforth be referred to as Contract No. IFB 24-062/MR, Jefferson County Diversion Center Remodel. The Contractor has not been authorized to commence any billable work or to provide any material or service under this contract until Contractor receives a purchase order and/or a notice to proceed from the Jefferson County Purchasing Agent.

COUNTERSIGNED:

Jeff R. Branick, County Judge **JEFFERSON COUNTY, TEXAS**	**Date**

ATTEST:

Roxanne Acosta Hellberg, County Clerk **JEFFERSON COUNTY, TEXAS**	**Date**

BIDDER: INSERT ALL ADDENDA BEHIND THIS PAGE.
PLEASE BE SURE TO COMPLETE, SIGN, ATTEST, AND DATE EACH ADDENDUM.

<u>BIDDER</u>: INSERT BID SECURITY BEHIND THIS PAGE.

Line Item	Description	Bid Amount
1	Mold Remediation – Honesty Environmental Protocol	
2	Division 01 General Requirements – Brave Architecture Specifications	
3	Division 02 Existing Conditions – Brave Architecture Specifications	
4	Division 03 Concrete – Brave Architecture Specifications	
5	Division 04 Masonry – Brave Architecture Specifications	
6	Division 05 Metals – Brave Architecture Specifications	
7	Division 06 Wood, Plastics and Composites – Brave Architecture Specifications	
8	Division 07 Thermal and Moisture Protection – Brave Architecture Specifications	
9	Division 08 Openings – Brave Architecture Specifications	
10	Division 09 Finishes – Brave Architecture Specifications	
11	Division 10 Specialties – Brave Architecture Specifications	
12	Division 12 Furnishings – Brave Architecture Specifications	
13	Division 22 Plumbing (ASEI) – Brave Architecture Specifications	
14	Division 23 Heating, Ventilation and Air Conditioning (ASEI) – Brave Architecture Specifications	
15	Division 26 Electrical (ASEI) – Brave Architecture Specifications	
16	Division 27 Communications (Datacom) - Brave Architecture Specifications	
17	Division 28 Electronic Safety and Security (Datacom) - Brave Architecture Specifications	

Line Item	Description	Bid Amount
18	Division 31 Earthwork (D+A Civil) - Brave Architecture Specifications	
19	Division 32 Exterior Improvements – Brave Architecture Specifications	
20	Division 33 Utilities (D+A Civil) – Brave Architecture Specifications	

BIDDER ACKNOWLEDGEMENT OF BID ADDENDA (IF APPLICABLE):

Addendum 1 _____ Date Received_____

Addendum 2 _____ Date Received_____

Addendum 3 _____ Date Received_____

BIDDER: INCLUDE FULL, SIGNED, & ATTESTED COPY OF EACH ADDENDUM ISSUED WITH BID SUBMISSION.

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

VENDOR REFERENCES FORM

Bidder: 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.

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

REFERENCE ONE

Government/Company Name: _____

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: _____

SIGNATURE PAGE

As permitted under Article 4413 (32c) V.A.C.S., other governmental entities may wish to participate under the same terms and conditions contained in this contract (i.e., piggyback). In the event any other entity participates, all purchase orders will be issued directly from and shipped directly to the entity requiring supplies/services. Jefferson County shall not be held responsible for any orders placed, deliveries made or payment for supplies/services ordered by another entity. Each entity reserves the right to determine their participation in this contract.

Would Bidder be willing to allow other governmental entities to piggyback off this contract, if awarded, under the same terms and conditions? .....**Yes** ☐ **No** ☐

This bid shall remain in effect for ninety (90) days from bid opening and shall be exclusive of federal excise and state and local sales tax (exempt).

The undersigned agrees, if this bid is accepted, to furnish any and all items upon which prices are offered, at the price and upon the terms and conditions contained in the Invitation for Bid, Conditions of Bidding, Terms of Contract, and Specifications and all other items made a part of the accepted contract.

The undersigned affirms that they are duly authorized to execute the contract, that this company, corporation, firm, partnership or individual has not prepared this bid in collusion with any other Bidder, and that the contents of this bid as to prices, terms or conditions of said bid have not been communicated by the undersigned nor by any employee or agent to any other Bidder or to any other person(s) engaged in this type of business prior to the official opening of this bid. And further, that neither the Bidder nor their employees nor agents have been for the past six (6) months directly nor indirectly concerned in any pool or agreement or combination to control the price of goods or services on, nor to influence any person to bid or not to bid thereon.

Bidder (Entity Name)	Signature
Street & Mailing Address	Print Name
City, State & Zip	Date Signed
Telephone Number	Fax Number
E-mail Address	

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, 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 undersigned, 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.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

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.

The Contractor, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

_____

Signature of Contractor's Authorized Official

_____

Name and Title of Contractor's Authorized Official *(Please Print)*

_____

Date

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

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

Adopted 8/7/2015

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

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

THIS FORM IS FOR OFFICE USE ONLY

GOOD FAITH EFFORT (GFE) DETERMINATION CHECKLIST

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 HUBs 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 HUB Subcontractor participation. The Prime Contractor/Consultant may extend his/her efforts in soliciting HUB Subcontractor participation beyond what is listed below.

Did the Prime Contractor/Consultant . . .?

☐ 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 HUB Subcontractor participation?

☐ Yes ☐ No 2. **Notify** in writing a reasonable number of HUBs, allowing sufficient time for effective participation of the planned work to be subcontracted?

☐ Yes ☐ No 3. **Provide** HUBs 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 HUBs, and not reject bids from HUBs that qualify as lowest and responsive Bidders?

☐ Yes ☐ No 5. **Document** reasons HUBs were rejected? Was a written rejection notice, including the reason for rejection, provided to the rejected HUBs?

☐ Yes ☐ No 6. If Prime Contractor/Consultant has zero (0) HUB 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

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

NOTICE OF INTENT (NOI) TO SUBCONTRACT WITH HISTORICALLY UNDERUTILIZED BUSINESS (HUB)

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 HUB Subcontractor/Subconsultant with proper signatures, per the terms and conditions of your contract.

Contractor Name: _____ HUB: ☐ Yes ☐ No

Address: _____
Street City State Zip

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

Project Title & No.: _____

Prime Contract Amount: $ _____

HUB Subcontractor Name: _____

HUB Status (Gender & Ethnicity): _____

Certifying Agency: ☐ Tx. Bldg & Procurement Comm. ☐ Jefferson County ☐ Tx Unified Certification Prog.

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 HUB 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 "HUB Subcontractor/Subconsultant Change Form" must be completed and faxed to 409-835-8456.

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

HISTORICALLY UNDERUTILIZED BUSINESS (HUB)
SUCONTRACTING PARTICIPATION DECLARATION FORM

Bidder intends to utilize Subcontractors/Subconsultants in the fulfillment of this contract (if awarded).
☐ Yes ☐ No

Prime Contractor: _____ HUB: ☐ Yes ☐ No

HUB 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 HUB Subcontract(s): $ _____

Construction HUB Goals: 12.8% MBE:: _____ % 12.6% WBE: _____ %

Sub-goals: 1.7 African-American, 9.7% Hispanic, 0.7% Native American, 0.8% Asian American.
Use these goals as a guide to diversify.

FOR HUB OFFICE USE ONLY:

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

PART I. HUB SUBCONTRACTOR DISCLOSURE

HUB Subcontractor Name: _____

HUB Status (Gender & Ethnicity): _____

Certifying Agency: ☐ Texas Bldg & Procurement Comm. ☐ Texas Unified Certification Prog.

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: _____

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

HISTORICALLY UNDERUTILIZED BUSINESS (HUB)
SUBCONTRACTING PARTICIPATION DECLARATION FORM

HUB Subcontractor Disclosure

PART I: Continuation Sheet (Duplicate as Needed)

HUB Subcontractor Name: _____

HUB Status (Gender & Ethnicity): _____

Certifying Agency: ☐ Tx. Bldg & Procurement Comm. ☐ Jefferson County ☐ Tx Unified Certification Prog.

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: _____

HUB Subcontractor Name: _____

HUB Status (Gender & Ethnicity): _____

Certifying Agency: ☐ Tx. Bldg & Procurement Comm. ☐ Jefferson County ☐ Tx Unified Certification Prog.

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

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

HISTORICALLY UNDERUTILIZED BUSINESS (HUB)
SUCONTRACTING PARTICIPATION DECLARATION FORM

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

Instructions to Bidder: Please complete Good Faith Effort (GFE) Checklist and attach any supporting documentation.

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

- ☐ All Subcontractors to be utilized are "Non-HUBs." *(Complete Part III)*
- ☐ HUBs were solicited but did not respond.
- ☐ HUBs solicited were not competitive.
- ☐ HUBs were unavailable for the following trade(s):
- ☐ Other: _____

Was the Jefferson County HUB Office contacted for assistance in locating HUBs? ☐ Yes ☐ No

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

The Bidder shall use this area to provide a listing of all "Non-HUB" Subcontractors, including suppliers, that will perform under this project. A list of those "Non-HUB" 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-HUB" 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: _____

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

HISTORICALLY UNDERUTILIZED BUSINESS (HUB)
SUBCONTRACTING PARTICIPATION DECLARATION FORM

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 *HUB 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: _____

REQUIRED FORM
Bidder: Please complete this form and include with bid submission.

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) "Non-resident 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 _____ [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.):	
Company Name submitting bid/proposal:	
Mailing address:	
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.

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

HOUSE BILL 89 VERIFICATION

I, _____, the undersigned representative of (company or business name)_____ (heretofore referred to as company) being an adult over the age of eighteen (18) years of age, after being duly sworn by the undersigned notary, do hereby depose and verify under oath that the company named above, under the provisions of Subtitle F, Title 10, Government Code Chapter 2270:

1. Does not boycott Israel currently; and
2. Will not boycott Israel during the term of the contract.

Pursuant to Section 2270.002, Texas Government Code:

1. "**Boycott Israel**" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made ordinary business purposes; and

2. "**Company**" means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or an limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business association that exist to make a profit.

_____
Signature of Company Representative

_____
Date

On this _____ day of _____, 20____, personally appeared

_____, the above-named person, who after by me being duly sworn, did swear and confirm that the above is true and correct.

Notary Seal

_____
Notary Signature

_____
Date

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

SENATE BILL 252 CERTIFICATION

On this day, I, Deborah L. Clark, Purchasing Agent for Jefferson County, Texas, pursuant to Texas Government Code, Chapter 2252, Section 2252.152 and Section 2252.153, certify that I did review the website of the Comptroller of the State of Texas concerning the listing of companies that is identified under Section 806.051, Section 807.051, or Section 2253.253 and I have ascertained that the below named company is not contained on said listing of companies which do business with Iran, Sudan, or any Foreign Terrorist Organization.

_____

Company Name

_____

IFB/RFP/RFQ number

Certification check performed by:

_____

Purchasing Representative

_____

Date

THIS FORM IS FOR OFFICE USE ONLY

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_____ COUNTY OF_____

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

on this day personally appeared _____, who
(name)
after being by me duly sworn, did depose and say:

"I, _____ am a duly authorized officer of/agent
(name)
for _____ and have been duly authorized to execute the
(name of firm)
foregoing on behalf of the said_____.
(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:_____

_____

Fax: _____ Telephone#_____

by: _____ Title:_____
(print name)

Signature:_____

SUBSCRIBED AND SWORN to before me by the above-named

_____ on

this the _____ day of_____, 20___.

REQUIRED FORM
<u>Bidder</u>: Please complete this form and include with bid submission.

_____
Notary Public in and for
the State of _____

Mold Remediation Protocol

SURVEY LOCATION:	Diversion Center - Dorm 4 3890 FM 3514 Beaumont, Texas 77705
PROJECT CONTACT:	Ms. Mistey Reeves
SITE VISIT DATE:	June 7, 2024
PROJECT MANAGER:	Jarrold Ardoin, MAC #1288 Project Manager
REPORT DATE:	June 19, 2024
REPORT PREPARED BY:	Mohammed Hussein, MAC #1801 Operations Manager
REPORT APPROVED BY:	Daniel Ward Vice President
VERSION:	Original Final

TDLR Mold Assessment
Consultant
License: MAC1801
Expires: 09/22/2025

Honesty Environmental Services, Inc.

ASSESSMENT SUMMARY

On April 10, 2024, Mr. Jarrold Ardoin, a Texas Department of Licensing and Regulation (TDLR) Licensed Mold Assessment Consultant (MAC #1288) and EHS Specialist with Honesty Environmental Services, Inc, performed a mold assessment of the above mentioned facility. The assessment included visual observations, temperature, relative humidity, dew point, and surface moisture measurements. This work was requested and defined by Ms. Mistey Reeves of Jefferson County.

The purpose of this work, conducted on June 7, 2024, was to determine the extent of suspect visible mold within the subject areas within the structure and establish a scope of remediation work for the facility. It is the understanding of HES that this work was requested as a result of visible suspect mold in the subject areas of the facility.

As a result of the assessment, the following recommendations were made:

- Have a TDLR licensed Mold Assessment Consultant prepare a mold remediation protocol for the cleaning and/or removal of the mold impacted building materials identified.
- All sources of moisture shall be resolved prior to performing any mold remediation activities.
- The presence of mold in excess of 25 contiguous square feet throughout the building has been discovered. A mold protocol outlining a remediation scope of work must be developed and the mold contaminated building materials must be remediated by a TDLR-licensed Mold Remediation Contractor following TDLR rules and regulations.
- Clean and/or remove the mold impacted building materials throughout the facility with an EPA approved biocide agent to prevent any further mold growth.
- Install HEPA filtration air scrubbers to filter out mold spores from the air. Allow the air scrubbers to run for at least 48-72 hours before retesting the affected areas.
- Professionally clean the entire HVAC system, including all the HVAC unit(s), duct work and vents after repairs are complete. Install a new HVAC air filter(s) after the cleaning is completed and ensure that the air filter(s) is changed periodically per the manufacturer's recommendations.
- The HVAC system was not operating at the time of the assessment, which may have contributed to the elevated humidity levels in the interior of the building. HES recommends the HVAC system be turned on once mold remediation is complete and be allowed to cycle to reduce the humidity levels.
- Mold may exist in wall cavities or chases.

REMEDIATION PROTOCOL - CONTRACTOR

Eliminate Moisture Intrusion

Remediation should be conducted in accordance with the Texas Mold Assessment and Remediation Rules. Ensure that all moisture intrusion problems in the facility have been identified and completely repaired prior to beginning remediation work.

Scope of Work:

A licensed mold remediation contractor will be responsible for the following:

1. All items indicated in Table 1, Scope of Work for Remediation Activities.
    a. Isolate the work area with a local containment made of six mil polyethylene. Maintain diminished negative pressure within the containment using a HEPA filter negative air machine. Cover all HVAC supply and return air registers in the work area with six-millimeter polyethylene. Post warning signs at the entrance to the work area in accordance with EPA, OSHA and TDLR requirements.
2. Install “air-scrubbers” equipped with HEPA filtration throughout the remediation area to clean the air during remediation and following completion of remediation.
3. As part of a qualified Mold Remediation Project, remove/clean or encapsulate all water damaged and/or mold impacted material as indicated in the Scope of Work. It is estimated that the areas listed in the chart below will be impacted by the remediation. Based on visual inspection, additional quantities may exist inside wall cavity or behind walls. Mold growth that has been identified has the potential to grow, travel or increase in size due to conditions within the facility. Remediation Contractor is responsible for verifying quantities in the field.
4. If during the course of remediation additional water damage/suspect mold is discovered, remove any impacted materials as well. Document the quantity and condition of the materials, stop work, and obtain written approval from the Consultant/Client prior to removal. The integrity of the wall studs and all other structural members should be evaluated prior to remediation. **Contractor to remove 1 foot beyond any obvious water damage or visible mold growth.**
5. Upon completion of gross removal of building materials (as described in Table 1), complete the following for the building interior in the vicinity of the mold remediation project:
    a. Wipe down and remove all surface molds from exposed surfaces and wall studs. Wash affected exposed surfaces and wall studs with an EPA registered disinfectant detergent, (i.e., Sporicidin or Microban), per manufacturer’s recommendations. Ensure that the material is thoroughly dried to prevent the spread of mold proliferation.

b. HEPA vacuum the base of the remediation areas in the vicinity of the work areas. Upon completion, operate “air scrubbers” equipped with HEPA filtration throughout the area to clean the air.

c. DO NOT apply encapsulant until **AFTER** post remediation sampling has been performed by TDLR Mold Assessment Consultant.

d. Following remediation and as part of routine maintenance, inspect, repair, and clean the HVAC system prior to re-occupancy. Clean the HVAC supply and return registers located in the vicinity of the work areas.

e. Upon completion of remediation, notify the licensed Mold Assessment Consultant so that a post remediation assessment can be conducted.

f. Upon achieving clearance for all work areas, remove barriers.

Table 1 Remediation Scope of Work & Estimated Quantities are listed below.

Table 1 Remediation – Scope of Work

Location	Affected Material	Estimated Remediation Quantity
Pod 4A	Metal Doors and Window Frames	1,850 S.F.
	CMU Walls	10,000 S.F.
Pod 4A Office	Drywall Walls and Ceilings	150 S.F.
Pod 4B	Metal Doors and Window Frames	1,850 S.F.
	CMU Walls	10,000 S.F.

Location	Affected Material	Estimated Remediation Quantity
Pod 4C	Metal Doors and Window Frames	1,850 S.F.
	CMU Walls	10,000 S.F.
Pod 4C Office	Drywall Walls and Ceilings	475 S.F.
Pod 4D	Metal Doors and Window Frames	1,850 S.F.
	CMU Walls	10,000 S.F.
Control Room	Metal Doors	200 S.F.
	CMU Walls	510 S.F.

Personal Protective Equipment

The remediation contractor shall provide appropriate personal protective equipment for executing the work. Minimum recommendations are as follows:

- Minimum of Disposable clothing constructed of suitable materials such as DuPont Tyvek or equivalent.
- Minimum of Half-face respirators approved by NIOSH equipped with an N-95 filter.
- Minimum Headgear, eye protection, work gloves and footwear of size to properly fit individual workers and/or authorized visitors.

Worker Decontamination

Provide a decontamination area to allow workers to properly decontaminate prior to exiting the work area or removing materials from the work area. Use the following decontamination procedures for personnel in work area:

- Remove protective clothing before exiting the work area.
- Wet clean or HEPA-vacuum respirator, inner suit and exposed portions of the body in decontamination area.
- Maintain respiratory protection throughout the decontamination process.

POST REMEDIATION CLEARANCE REPORT

After remediation is complete for each work area, air scrubbers are recommended to be operated for at least 48 hours prior to the post remediation assessment. The post remediation assessment shall be conducted prior to build back.

The work area must be free from all visible mold, wood rot and water damage. Analytical and procedural inspection will be performed while the containment structure is still erected to determine adequate remediation.

The Mold Assessment Consultant will perform a post remediation clearance including the following:

- Visual inspection - A visual inspection of remediated areas for the absence of visible mold, dust, and wood rot prior to encapsulation.
- Analytical evaluation – Surface samples, as determined by the Mold Assessment Consultant prior to encapsulation.
- Surface samples must report no more than "**VERY LOW**" relative abundance of fungal spores according to Laboratory report.

Laboratory Surface Sample Relative Abundance Range			
N.D.	**None Detected**	No Fungal Spores Detected	PASS
<1+	**Scattered Spores**	1-20 fungal spores	PASS
1+	**Very Low**	21-100 fungal spores	PASS
2+	**Low**	101-1,000 fungal spores	FAIL
3+	**Moderate**	1,001-1,000 fungal spores	FAIL
4+	**High**	>10,000 fungal spores	FAIL

- **NO Stachybotrys** spores may be present for the containment to be considered clear.

A Post Remediation Clearance report will be issued by the Mold Assessment Consultant upon meeting clearance criteria.

Table 1 Scope of Work for Remediation Activities		
Location of Impacted Materials	**Scope of Remediation Work**	**Approx. Quantities of Materials to be Removed/Cleaned**
Pod 4A	1. Isolate the entire remediation work area from the public using warning tape, posting an 8" x 11" yellow sign with black lettering stating "NOTICE: Mold Remediation Project in Progress. 2. Block openings or other means of air migration into other building areas, including HVAC supply/return vents if present with one (1) layer of fire retardant 6-mil polyethylene sheeting. 3. Perform all work using HEPA vacuum or HEPA filtered negative air machine to generate air changes. Exhaust air outside of the building in such a manner as to avoid exhaust air being re-introduced into the facility. Barriers and ventilation should be placed in such a manner as to prevent spore migration from the current work area to other areas within the building. 4. Move all movable objects away from the wall. Clean and sanitize all non-porous equipment with EPA registered product. Discard any porous materials as these materials cannot be effectively cleaned and sanitized. 5. Remove any additional mold/water damaged materials discovered during remediation activities (i.e., wall studs and supporting frame work). 6. Clean walls, wall cavities, floors, and non-porous materials with an EPA	1,850 S.F. of Metal Doors and Window Frames, and 1,000 S.F. of CMU Brick Walls – Clean/Remove all non-porous surfaces as well as any additional material with Visible Mold Growth. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance.
Pod 4A Office		150 S.F. Drywall Wall System, Insulation & Debris plus any additional material with Visible Mold Growth. All non-porous surfaces are to be cleaned after removal. Remove visible mold growth or moisture impacted materials. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance

Table 1 Scope of Work for Remediation Activities		
Location of Impacted Materials	**Scope of Remediation Work**	**Approx. Quantities of Materials to be Removed/Cleaned**
Pod 4B	registered disinfectant detergent per manufacturer's recommendations. 7. Apply Encapsulant AFTER Mold Assessment Consultants Visual Inspection. 8. Notify the Mold Assessment Consultant upon completion for clearance and cleanliness verification. 9. Quantity of remediation is estimated, contractor is responsible for verifying quantities in the field.	1,850 S.F. of Metal Doors and Window Frames, and 1,000 S.F. of CMU Brick Walls – Clean/Remove all non-porous surfaces as well as any additional material with Visible Mold Growth. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance.
Pod 4C	1. Isolate the entire remediation work area from the public using warning tape, posting an 8" x 11" yellow sign with black lettering stating "NOTICE: Mold Remediation Project in Progress. 2. Block openings or other means of air migration into other building areas, including HVAC supply/return vents if present with one (1) layer of fire retardant 6-mil polyethylene sheeting. 3. Perform all work using HEPA vacuum or HEPA filtered negative air machine to generate air changes. Exhaust air outside of the building in such a manner as to avoid exhaust air being re-introduced into the facility. Barriers and ventilation should be placed in such a manner as to prevent spore migration from the current work area to other areas within the building. 4. Move all movable objects away from the wall. Clean and sanitize all non-porous equipment with EPA registered product. Discard any porous materials as these materials cannot be effectively cleaned and sanitized.	1,850 S.F. of Metal Doors and Window Frames, and 1,000 S.F. of CMU Brick Walls – Clean/Remove all non-porous surfaces as well as any additional material with Visible Mold Growth. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance.
Pod 4C Office		475 S.F. Drywall Wall System, Insulation & Debris plus any additional material with Visible Mold Growth. All non-porous surfaces are to be cleaned after removal. Remove visible mold growth or moisture impacted materials. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance

Table 1 Scope of Work for Remediation Activities		
Location of Impacted Materials	**Scope of Remediation Work**	**Approx. Quantities of Materials to be Removed/Cleaned**
Pod 4D	5. Remove any additional mold/water damaged materials discovered during remediation activities (i.e., wall studs and supporting frame work). 6. Clean walls, wall cavities, floors, and non-porous materials with an EPA registered disinfectant detergent per manufacturer's recommendations. 7. Apply Encapsulant AFTER Mold Assessment Consultants Visual Inspection. 8. Notify the Mold Assessment Consultant upon completion for clearance and cleanliness verification. 9. Quantity of remediation is estimated, contractor is responsible for verifying quantities in the field.	1,850 S.F. of Metal Doors and Window Frames, and 1,000 S.F. of CMU Brick Walls – Clean/Remove all non-porous surfaces as well as any additional material with Visible Mold Growth. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance.
Control Room		200 S.F. of Metal Doors and Window Frames and 510 S.F. of CMU Brick – Clean/Remove all non-porous surfaces as well as any additional material with Visible Mold Growth. All surfaces are to be HEPA Vacuumed, cleaned with EPA Registered solution following removal and HEPA filter air scrubbing for a minimum of 48 hours prior to clearance.

Jefferson County
Diversion Center Renovation

PO 091688 / B/A Project No. 23141

3890 FM3514
Beaumont, TX 77705

Specifications

Issued for:
PERMIT/BID
100% Construction Documents

September 23, 2024

BRAVE/ architecture

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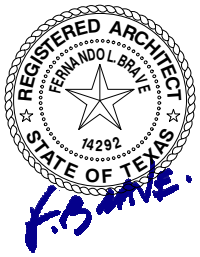
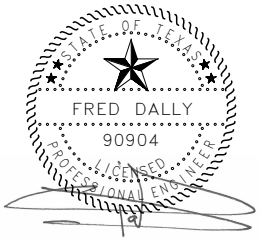
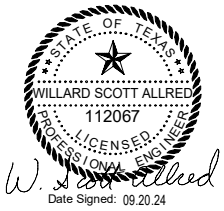
ARCHITECT **Brave**/architecture 4200 Montrose Blvd. Suite 400 Houston, Texas 77006 Phone: (713) 524 5858	 09/23/2024
CIVIL Dally + Associates 9800 Richmond Ave Suite 460 Houston, Texas 77042	 09/23/2024
LANDSCALE KW Landscape Architects 6925 Portwest Drive, Suite 100 Houston, Texas 77024	 Date Signed: 09.20.24

STRUCTURAL Dally + Associates 9800 Richmond Ave Suite 460 Houston, Texas 77042	 09/23/2024
MEP ASEI Engineering 350 Glenborough Dr, Suite 270 Houston, Texas 77067	 Date Signed: 09.20.24
BUILDING ENVELOPE Price Consulting Inc 211 Highland Cross Drive Suite 200 Houston, Texas 77073	
AV/IT CONSULTANT Datacom Design Grop 9111 Jollyville Road, Suite 290 Austin, Texas 78759	

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8117 PRESTON ROAD , SUITE 300 , DALLAS , TEXAS 75225 ~ 800.966.6088
950 W. BANNOCK STREET , SUITE 1100 , BOISE , IDAHO 83702 ~ 208.292.9130

August 1, 2024

Ms. Mili Mehta, AIA
Brave Architecture
4200 Montrose Boulevard, Suite 400
Houston, Texas 77006

Re: Existing Conditions, Building Envelope
Jefferson County Diversion Center Dormitory
3890 FM 3514
Beaumont, Texas 77705
PCI Project 12265.24.01

Dear Ms. Mehta,

Price Consulting, Inc. (PCI) is pleased to submit our assessment of the existing conditions of the Jefferson County Diversion Center Dormitory located in Beaumont, Texas. PCI was requested to perform a review of the building envelope components, including roofing, exterior walls, windows, and waterproofing. Our narrative includes our understanding of the project background, a summary description of the subject building's exterior wall and roof systems, and our recommendations for repairs and renovations.

PROJECT INFORMATION

It is our understanding that this project consists of the renovation and redesign of an existing dormitory building. The plan dimensions of the building are approximately 152 feet by 122 feet, with approximately 18,000 square feet of enclosed space. The dormitory building includes four individual pods, and a central control room. Each pod includes sixteen single occupancy transient sleeping units, communal restrooms, lounge area, management offices, and clinical exam rooms. Mechanical rooms and a Second level mezzanine are present in each end of the building. The building reportedly was constructed around 1997, and renovated around 2007.

GENERAL CONSTRUCTION

The dormitory building is a steel frame structure with tapered steel girders and columns. The roof structure is constructed with 30-inch wide prefinished steel standing seam trapezoidal roof panels, a fiberglass insulation blanket, and cold-formed steel purlins. The roof slopes at approximately 2-inches per foot to gutters installed on the North and South elevations of the building. The gutters drain into downspouts. Equipment on the roof includes curb-mounted skylight tubes, curb mounted power vents, curb-mounted intake vents, heat vents, gravity vents, and plumbing vents.

PROFESSIONAL CONSULTANTS FOR BUILDING ENVELOPE TECHNOLOGY

The exterior walls of the dormitory include prefinished steel "R" panels, light gauge horizontal girts supporting the "R" panels, foil-faced fiberglass insulation batts behind the metal panels, a light gauge metal stud back-up wall, and a CMU interior wall. Exterior walls below the North and South elevation canopies are constructed with brick masonry. Windows in the building are security glazing glass lites (Composite laminated tempered glass and polycarbonate sheets) set in steel angle window frames with glazing tape. Steel doors at entrances contain security glazing lites. Steel doors at entrances to mechanical rooms contain louvers.

OBSERVATIONS

PCI noted the following items on the exterior walls and roof:

Exterior Walls

1. The existing "R" panels are supported by light gauge steel horizontal girts attached to a light gauge steel frame wall.
2. "R" panel exterior wall panels are corroded through at the bottom end of the panels in several locations.
3. Corrosion is present on the fasteners used to secure the "R" panels to the horizontal girts and metal stud back-up wall.
4. Variations in color and appearance in the "R" panels are present in the building, indicating apparent previous repairs and / or replacement of metal panels in select locations.
5. Sealants installed in the prefinished metal trim around window and door openings are deteriorated.
6. The security glazing lites in windows and doors typically exhibit evidence of discoloration of the PVB interlayer.
7. Light corrosion was observed on the steel window frames and exterior steel stops.
8. Concealed-fastener soffit panels installed in the East and West canopies are damaged.
9. Steel trim at the perimeter of the soffit panels exhibits evidence of minor corrosion.
10. Biological growth was observed on brick masonry column covers due to water discharge from downspouts.

Roof

Historical aerial photographs of the building indicate previous windstorm damage to the existing roof system occurred around 2012. The damage appears to have been repaired around 2017. The repairs included replacement of the ridge cap on the North end of the building, securement of the North elevation rake edge flashing near the ridge, and replacement of the first two roof panels adjacent to the North elevation rake edge flashing. Evidence of isolated repairs to the trapezoidal roof panels is present, including patches to the roof panels, isolated exposed fasteners in the roof panels, standing seam repairs, and lap seam repairs.

PCI observed the following:

11. Insulation installed below the roof panels are fiberglass batts with a vinyl facer draped over the purlins. The R-value of the insulation is not known.
12. Corrosion was observed on the skylight tube metal caps and curbs on the steep slope roof system.
13. The exterior lenses on the skylight tubes are weathered and discolored.
14. Galvanized sheet metal penetration flashings exhibit light to moderate corrosion.
15. The metal cap on one vent penetration is missing.
16. One metal vent penetration is missing. The penetration in the roof panel is unsealed.
17. Rubber boot flashings around vent pipes, gravity vents, and plumbing vents are weathered and deteriorated.
18. Sealant repairs at the intersection of roof panels to curb flashings are deteriorated.
19. Exposed fasteners at end laps are corroded in several locations.
20. The downspouts on the building have been removed approximately 2 feet below the low eave of building in all locations.
21. Evidence of leaks in the building interior were observed; however, the source or sources of the leaks were not determined. Facility personnel indicated some of the leaks were due to mechanical equipment in the building.

RECOMMENDATIONS

Exterior Walls

Exterior wall repairs will include the following:

1. Removal of existing prefinished "R" panels.
2. Removal of existing fiberglass batt insulation.
3. Construction of a new air and water barrier system and flashings in accordance with the current Energy Conservation Code.
4. Installation of new insulation with R-values in accordance with the current Energy Conservation Code.
5. Installation of new metal girts and new metal wall panels or alternate wall finishes.
6. Removal and replacement of window frames and 1 5/16-inch impact resistant insulated glass.
7. Removal and replacement of steel doors and door flames.
8. Repair damaged soffit panels.
9. Pressure wash and apply clear water repellent sealer to exposed brick masonry.
10. Removal and replacement of sealants in brick masonry, and at intersections of brick masonry to exterior wall trim, door frames, and window frames.

Roof

PCI recommends installing a new standing seam symmetrical metal panel roof overlay system over the existing trapezoidal standing seam metal panel roof system, typified by the "238T" standing seam roof panels produced by McElroy Metal. Several other roof panel manufacturers produce similar standing seam symmetrical roof panel systems. Standing seam symmetrical roof panels provide the following benefits:

- High wind uplift resistance capacity
- Panels can be produced in the field to the length required, eliminating field lap seams
- Individual roof panels can be removed and replaced in the future without the need to remove adjacent roof panels

The new overlay roof system would be secured to the existing roof support structure to resist wind uplift pressures required by the current building codes. The new roof system would include the addition of new insulation to meet the current Energy Conservation Code requirements. Removal of abandoned and unused equipment and penetrations would be included in the work. New curbs with integral cricket flashings will be installed. Replacement of flashings, vents, and skylight tube lenses and caps would also be performed. Installation of new gutters, downspouts, and splash blocks would be included.

We trust that our recommendations are satisfactory, and look forward to the opportunity to work with Brave Architecture on this important project. Please contact our office if you have any questions, or if we can be of service in any other way.

Best regards,

PRICE CONSULTING, INC.
Texas Registered Engineering Firm F-3814

Bruce M. Cummins, P.E.
Project Engineer

STATE OF TEXAS
BRUCE M. CUMMINS
73928
REGISTERED
PROFESSIONAL ENGINEER
8-1-24

1. JEFFERSON COUNTY DIVERSION CENTER DORMITORY, OVERALL VIEW

2. EVIDENCE OF PREVIOUS REPAIRS AND RENOVATIONS TO EXISTING METAL "R" PANEL WALLS

3. EVIDENCE OF PREVIOUS RENOVATIONS TO "R" PANELS. NOTE DOWNSPOUTS HAVE BEEN REMOVED.

4. TYPICAL CORROSION IN EXTERIOR WALL FASTENERS AND METAL FLASHING

5. TYPICAL CORROSION IN EXISTING METAL "R" PANELS

6. TYPICAL CORROSION IN EXISTING METAL "R" PANELS

7. STEEL FLAME WINDOW WITH LAMINATED GLASS LITE AND STEEL STOP

8. MINOR CORROSION IN STEEL WINDOW FRAME AND STEEL STOP

9. STEEL WINDOW FRAME AND LAMINATED GLASS LITES

10. TYPICAL DISCOLORATION IN LAMINATED GLASS LITE PVB INTERLAYER

11. MINOR CORROSION IN STEEL TRIM AROUND CANOPY SOFFIT

12. DAMAGED METAL SOFFIT PANELS

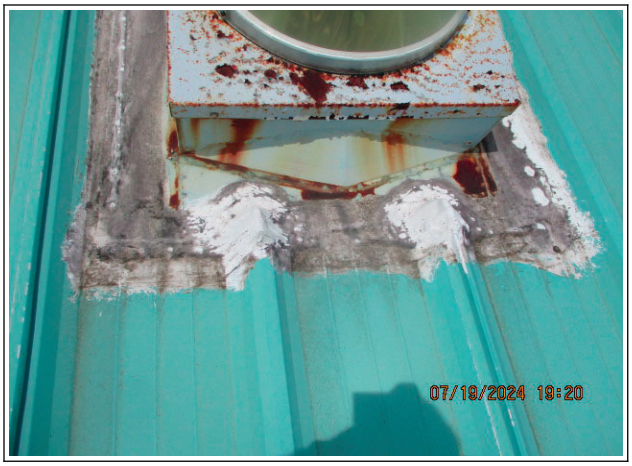
13. OVERALL VIEW OF STANDING SEAM METAL TRAPEZOIDAL PANEL ROOF SYSTEM

14. REPAIRS TO ROOF RIDGE, RAKE EDGE, AND METAL ROOF PANELS ALONG NORTH ELEVATION

15. REPAIRS TO ROOF PANELS ALONG NORTH ELEVATION RAKE EDGE

16. ROOF PENETRATION REMOVED WITHOUT SEALING OR COVERING RUBBER BOOT

17. CAP MISSING ON VENT PENETRATION



18. TYPICAL REPAIRS TO SKYLIGHT TUBE CURB FLASHING

19. TYPICAL CORROSION ON SKYLIGHT TUBE CURB CAP. NOTE LENS IS DISCOLORED.

20. TYPICAL REPAIRS TO POWER VENT CURB FLASHING

21. CORRODED FASTENERS IN RIDGE VENT

22. REPAIR AT STANDING SEAM PANEL CLIP LOCATION

23. REPAIR AT STANDING SEAM PANEL LAP SEAM

24. TYPICAL CORROSION ON GRAVITY VENT FLASHING

Mold Assessment Report

for

Diversion Center – Dorm 4
3890 FM 3514
Beaumont, Texas 77705

Prepared for:

Jefferson County
1149 Pearl Street
Beaumont, Texas 77701

HES Project No. 24B-1980-15118
April 2024

April 18, 2024

Jefferson County
1149 Pearl Street
Beaumont, Texas 77701
Email: mistey.reeves@jeffcotx.us
Tel: 409-835-8693
Attn: Ms. Mistey Reeves

Re: Mold Assessment Report
Diversion Center - Dorm 4
3890 FM 3514
Beaumont, Texas 77705
HES Project No. 24B-1980-15118

General Information

In accordance with your request, Honesty Environmental Services, Inc. (HES) has conducted a Mold Assessment at the above referenced site. Spore trap air samples were collected, and a chain of custody was initiated. The samples were delivered to the laboratory for analysis. The results of the sampling, performed on April 10, 2024 by Jarrold Ardoin, a Texas Department of Licensing and Regulation (TDLR) licensed Mold Assessment Consultant (License # MAC1288) can be found in this report.

The spore trap air samples were analyzed for fungal/mold agents by Southeast Environmental Microbiology Laboratories (SEEML) located at 440 Cobia Drive, Ste. 1901 in Katy, Texas 77494. The laboratory report issued by SEEML, Inc., a TDLR licensed Mold Analysis Laboratory (License LAB1016) is attached.

At the time of the Mold Assessment of the facility, the outside atmospheric conditions were: 90.6°F temperature, clear skies with 64.2% relative humidity.

Facility Inspection

An inspection of the facility was conducted to determine whether situations or conditions existed that could contribute to mold growth.

The inspection consisted of visually inspecting accessible building materials in the facility and air sampling to document the kinds of fungi present, if any.

Spore Trap Air Sampling

Indoor air sampling consisted of 22 samples collected. One additional sample was collected outside the building for comparison purposes. Total mold bioaerosol sampling was performed to identify and characterize general fungal concentrations in the subject areas. The total bioaerosol concentration is the result of both viable (culturable) and non-viable airborne fungal components. Total bioaersol concentrations were determined by sampling with Allergenco D brand cassettes connected to a vacuum pump at a flow rate of 15 liters per minute. Bioaerosols were collected in representative indoor areas for ten-

minute periods. Airborne bioaerosols were impacted onto prepared microscope slides within the Allergenco D brand cassettes. Total bioaerosol sampling protocols were conducted in accordance with the American Conference of Governmental Industrial Hygienists, ACGIH publication Guidelines for the Assessment of Bioaerosols in the Indoor Environment.

Qualitative and quantitative analysis of bioaerosols were performed by direct microscopic examination. Quantitative values were calculated by dividing the raw spore counts by the volume of air sampled and dividing by the fraction of the slide analyzed. All components were reported in particles per cubic meter (particles/m^3). A total concentration of particles/m^3 was also reported for each sample location. The indoor concentrations are compared to the outdoor concentrations. Indoor concentrations exceeding outdoor concentrations are generally considered unacceptable.

The spore trap samples were delivered to the laboratory for analysis using Light Microscopy. The Sample Summary Table 1 lists the sample number, location and results for each spore trap air sample collected. The laboratory analytical data can be found as an attachment to this report.

Tape Lift Surface Sampling

Cellophane tape was used to collect sixteen (16) sample(s) from surfaces that had suspect visible mold growth. After sampling, the tape was adhered to a glass microscope slide, labeled, and delivered to the laboratory for analysis. Tape lift media for sampling can identify species of fungal spores, and quantities are reported in relative abundance.

The Sample Summary Table 2 lists the sample number, location and results for each tape lift sample collected. The laboratory analytical data can be found as an attachment to this report.

Climatologic Direct Measurements

The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) published recommendations regarding thermal comfort. ASHRAE standard 55-1992, “Thermal Environment Conditions for Human Occupancy,” defines the desired conditions for the work environment. The desired conditions exist when temperature and humidity is in a range at which 80% or more of building occupants would feel comfortable while dressed in “typical” clothing and engaged in light, mostly sedentary activities. In order to avoid conditions sufficiently moist to promote the growth of molds or other bio-growth, relative humidity should not exceed 60%.

Measurements of temperature, relative humidity and dew point were conducted using an FLIR MR277 Moisture Meter, MSX IR Camera & Hygrometer, an electronic monitoring instrument. The instrument provides direct-reading measurements of temperature within the range of -4° to 160° F and relative humidity within the range of 0% to 100%. Measurements were conducted in various locations throughout the building.

Facility Inspection Visual Observations

- Visible mold growth was observed on the green metal door, beige metal door, and CMU wall of Pod 4A at the time of the assessment.
- Visible mold growth was observed on the Drywall wall of the Pod 4A office area at the time of the assessment.
- Visible mold growth was observed on the green metal door frame, beige metal door frame, and metal window frame of Pod 4B at the time of the assessment.
- Visible mold growth was observed on the CMU wall, green metal door frame, and beige metal door frame of Pod 4C at the time of the assessment.
- Visible mold growth was observed on the Drywall Wall and beige metal door frame of the Pod 4C office area at the time of the assessment.
- Visible mold growth was observed on the beige metal door, CMU wall, and green door of Pod 4D at the time of the assessment.
- Visible mold growth was observed on the beige metal door and metal window frame of the control room at the time of the assessment.
- The HVAC system was not operating at the time of the assessment.

Spore Trap Air Sampling Analytical Results

- Individual concentrations of *Cladosporium, Penicillium/Aspergillus,* and *Smuts/ Periconia/Myxomy* type mold spore species were found at higher concentrations in the north section of corridor A100 as compared to the outside reference sample at the time of the assessment.
- Individual concentrations of *Curvularia, Memnoniella, Penicillium/Aspergillus* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in the south section of corridor A112 as compared to the outside reference sample at the time of the assessment.
- Individual concentrations of *Cladosporium, Penicillium/Aspergillus* and *Smuts/ Periconia/Myxomy* type mold spore species were found at higher concentrations in the north section of day room A106 as compared to the outside reference sample at the time of the assessment.
- Individual concentrations of *Cladosporium,* and *Smuts/ Periconia/Myxomy* type mold spore species were found at higher concentrations in the south section of day room A106 as compared to the outside reference sample at the time of the assessment.
- Individual concentrations of *Curvularia, Penicillium/Aspergillus* and *Smuts/*

Periconia/Myxomy type mold spore species were found at higher concentrations in group room A119 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Bipolaris/Drechslera, Cladosporium, Nigrospora, Penicillium/Aspergillus* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in the north section of corridor C100 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Bipolaris/Drechslera, Cladosporium, Nigrospora,* and *Penicillium/Aspergillus* type mold spore species were found at higher concentrations in the south section of corridor C112 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium, Curvularia, Epicoccum, Penicillium/Aspergillus* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in the north section of day room C106 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium, Curvularia, Penicillium/Aspergillus, Pithomyces,* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in the south section of day room C106 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium, Epicoccum, Nigrospora, Penicillium/Aspergillus* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in office C120 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium and Penicillium/Aspergillus* type mold spore species were found at higher concentrations in the north section of day room D106 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium* type mold spore species were found at higher concentrations in the south section of day room D106 than the outside reference sample at the time of the assessment.
- Individual concentrations of *Cladosporium* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in office D121 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Tetraploa* type mold spore species were found at higher concentrations in the north section of corridor B100 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Smuts/Periconia/Myxomy* type mold spore species were

found at higher concentrations in the south section of corridor B109 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium* and *Tetraploa* type mold spore species were found at higher concentrations in the north section of day room B106 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium, Nigrospora and* Penicillium/Aspergillus type mold spore species were found at higher concentrations in the south section of day room B106 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Cladosporium, Curvularia, Nigrospora,* and *Smuts/Periconia/Myxomy* type mold spore species were found at higher concentrations in office B122 as compared to the outside reference sample at the time of the assessment.

- Individual concentrations of *Pithomyces* type mold spore species were found at higher concentrations in the control room as compared to the outside reference sample at the time of the assessment.

- *Stachybotrys* and *Chaetomium* was not present in the samples collected from the interior of the facility, nor the outside reference sample at the time of the assessment.

Tape Lift Sampling Analytical Results

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at moderate concentrations on the tape lift sample collected from the metal green door in Pod 4A at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the metal beige door in Pod 4A at the time of the assessment.

- *Acremonium* type mold spore species were found at low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at very low concentrations on the tape lift sample collected from the CMU block wall in Pod 4A at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations on the

tape lift sample collected from the drywall in the Pod 4A office at the time of the assessment.

- *Acremonium* type mold spore species were found at low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the CMU block wall in Pod 4C at the time of the assessment.

- *Cladosporium* type mold spore species were found at moderate concentrations and *Penicillium* type mold spore species were found at high concentrations on the tape lift sample collected from the metal green door frame in Pod 4C at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at moderate concentrations on the tape lift sample collected from the drywall in Pod 4C office at the time of the assessment.

- *Acremonium* type mold spore species were found at low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the metal beige door frame in Pod 4C at the time of the assessment.

- *Acremonium* type mold spore species were found at very low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at very low concentrations on the tape lift sample collected from the metal beige door in the control room at the time of the assessment.

- *Acremonium* type mold spore species were found at very low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the metal window frame in the control room at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the metal beige door in Pod 4D at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at moderate

concentrations on the tape lift sample collected from the CMU block wall in Pod 4D at the time of the assessment.

- *Cladosporium* type mold spore species were found at low concentrations and *Penicillium/Aspergillus* type mold spore species were found at high concentrations on the tape lift sample collected from the metal green door in Pod 4D at the time of the assessment.

- *Acremonium* type mold spore species were found at low concentrations, *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at low concentrations on the tape lift sample collected from the metal green door frame at pod 4B at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at high concentrations on the tape lift sample collected from the metal beige door frame in Pod 4B at the time of the assessment.

- *Cladosporium* type mold spore species were found at high concentrations and *Penicillium/Aspergillus* type mold spore species were found at very low concentrations on the tape lift sample collected from the metal window frame in Pod 4B at the time of the assessment.

Climatologic Readings

- Temperature levels at the interior of the facility exceeded the recommended range of 70°F to 75°F. Temperature levels ranged from 73.8°F to 78.0°F at the time of the assessment.

- Relative humidity levels at the interior of the facility exceeded the recommend level of less than 60%. Humidity levels ranged from 68.3% to 78.7%.

Conclusion

- Individual concentrations of *Bipolaris/Drechslera, Cladosporium*, *Curvularia, Epicoccum, Memnoniella, Nigrospora, Penicillium/Aspergillus, Pithomyces, Smuts/ Periconia/Myxomy, and Tetraploa* type mold spore species were found at higher concentrations inside the facility as compared to the outside reference sample at the time of the assessment.

- *Acremonium*, *Cladosporium, Penicillium/Aspergillus,* and *Penicillium* type mold spore species were found on the tape lift samples collected from within the facility.

- Temperature levels at the interior of the facility exceeded the recommended range of 70°F to 75°F. Temperature levels ranged from 73.8°F to 78.0°F at the time of the assessment.

- Relative humidity levels at the interior of the facility exceeded the recommend level of less than 60%. Humidity levels ranged from 68.3% to 78.7%.

Recommendations

- All sources of moisture shall be resolved prior to performing any mold remediation activities.

- The presence of mold in excess of 25 contiguous square feet throughout the building has been discovered. A mold protocol outlining a remediation scope of work must be developed and the mold contaminated building materials must be remediated by a TDLR-licensed Mold Remediation Contractor following TDLR rules and regulations.

- Clean and/or remove the mold impacted building materials throughout the facility with an EPA approved biocide agent to prevent any further mold growth.

- Install HEPA filtration air scrubbers to filter out mold spores from the air. Allow the air scrubbers to run for at least 48-72 hours before retesting the affected areas.

- Professionally clean the entire HVAC system, including all the HVAC unit(s), duct work and vents after repairs are complete. Install a new HVAC air filter(s) after the cleaning is completed and ensure that the air filter(s) is changed periodically per the manufacturer's recommendations.

- The HVAC system was not operating at the time of the assessment, which may have contributed to the elevated humidity levels at the interior of the residence. HES recommends the HVAC system be turned on once mold remediation is complete and be allowed to cycle to reduce the humidity levels.

- Mold may exist in wall cavities or chases.

- Follow the general mold prevention tips found below.

General Mold Information

What is mold?

- A non-specific term for a type of fungus.
- Mildew is sometimes used interchangeably with the word mold it is also a type of fungus.
- There are over 100,000 known types of fungi.
- Mold propagates by spreading a large number of spores, which travel through the air.
- Because there are so many different types of fungi it is difficult to know how to terminate an outbreak.

What causes mold to grow?

- Mold spores are everywhere.
- Food (organic materials, paper, dust, cloth, starch, etc.).
- Moisture from high humidity (over 60%)
- Mold likes high temperatures (mid 70°F), darkness, and stagnant air.

Why is mold a problem?

- Mold can eat organic materials such as paper, dust, adhesives, leather, cloth, starches.
- Mold can stain paper, cloth, leather.
- Some varieties of mold are toxic to humans.

How to combat mold: DON'T ALLOW IT TO DEVELOP

- Maintain moderate temperature and humidity (70-72°F and 55% or lower relative humidity)
- Circulate air.
- Dust regularly.

Mold Prevention Tips

The following recommendations were taken from the EPA's "Mold Remediation in Schools and Commercial Buildings":

- Fix leaky plumbing and leaks in the building envelope as soon as possible.

- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.

- Prevent Moisture due to condensation by increasing surface temperature of reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).

- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside where possible.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30-50%, if possible.
- Perform regular building / HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide drainage and slope the ground away from the foundation.

We appreciate the opportunity to provide our services to you. Please feel free to call if there are any questions.

Sincerely,
Honesty Environmental Services, Inc.

Jarrold Ardoin
Project Manager

Dan Ward
Vice President

Attachments
Laboratory Analytical Results
Photographs
TDLR Licenses
Texas Consumer Mold Information Sheet

Sample Summary Table 1
Spore Trap Air Samples

Sample No.	*Location*	*Total Fungal Count (Spores/m³)*
MA-01	Exterior	4370
MA-02	North Section Corridor A100	2190
MA-03	South Section Corridor A112	1110
MA-04	North Section Day Room A106	1650
MA-05	South Section Day Room A106	547
MA-06	Group Room A119	1250
MA-07	North Section Corridor C100	2990
MA-08	South Section Corridor C112	4360
MA-09	North Section Day Room C106	6210
MA-10	South Section Day Room C106	2990
MA-11	Office C120	4350
MA-12	North Section Corridor D100	960
MA-13	South Section Corridor D109	640
MA-14	North Section Day Room D106	507
MA-15	South Section Day Room D106	640
MA-16	Office D121	494
MA-17	North Section Corridor B100	461
MA-18	South Section Corridor B109	707
MA-19	North Section Day Room B106	1960

Sample No.	*Location*	*Total Fungal Count (Spores/m³)*
MA-20	South Section Day Room B106	1330
MA-21	Office B122	1110
MA-22	Control Room	221
MA-23	Exterior	5310

Sample Summary Table 2
Tape Lift Sample

Sample Number	Sample Location	Fungal Structures Identified	Relative Abundance
T-01	Metal Green Door – Pod 4A	Cladosporium Penicillium/Aspergillus	H M
T-02	Metal Beige Door – Pod 4A	Cladosporium Penicillium/Aspergillus	H L
T-03	CMU Wall – Pod 4A	Acremonium Cladosporium Penicillium/Aspergillus	L H VL
T-04	Drywall - Pod 4A Office	Cladosporium	H
T-05	CMU Wall – Pod 4C	Acremonium Cladosporium Penicillium/Aspergillus	L H L
T-06	Metal Green Door Frame – Pod 4C	Cladosporium Penicillium	M H
T-07	Drywall – Pod 4C Office	Cladosporium Penicillium/Aspergillus	H M
T-08	Metal Beige Door Frame – Pod 4C	Acremonium Cladosporium Penicillium/Aspergillus	L H L
T-09	Metal Beige Door – Control Room	Acremonium Cladosporium Penicillium/Aspergillus	VL H VL
T-10	Metal Window Frame – Control Room	Acremonium Cladosporium Penicillium/Aspergillus	VL H L
T-11	Metal Beige Door – Pod 4D	Cladosporium Penicillium/Aspergillus	H L

Sample Number	Sample Location	Fungal Structures Identified	Relative Abundance
T-12	CMU Wall – Pod 4D	Cladosporium Penicillium/Aspergillus	H M
T-13	Metal Green Door – Pod 4D	Cladosporium Penicillium/Aspergillus	L H
T-14	Metal Green Door Frame – Pod 4B	Acremonium Cladosporium Penicillium/Aspergillus	L H L
T-15	Metal Beige Door Frame – Pod 4B	Cladosporium Penicillium/Aspergillus	H H
T-16	Metal Window Frame – Pod 4B	Cladosporium Penicillium/Aspergillus	H VL

LABORATORY ANALYTICAL RESULTS

SEEML Reference Number:
H-240411020

Southeast Environmental Microbiology Laboratories
410 W Grand Pkwy S, Suite 250
Katy, TX. 77494
Phone: 832-437-2667

The information and data for **Honesty Environmental Services, Inc.** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- [x] Surface/Bulk Report
- [ ] Andersen Fungal Report
- [x] Spore Trap Report
- [ ] Quantitative Fungal Report

Lab Manager Review : *Magzoub Ismail* Date : 04-11-2024

Thank you for using SEEML laboratories. We strive to provide superior quality and service. SEEML laboratories are accredited through AIHA LAP, LLC (EMLAP #232339) for the analysis of Spore Traps and Surface/Bulk Samples and licensed by the Texas Department of Licensing and Regulation (LAB1016).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

Confidentiality Notice:
The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of the document(s) is strictly prohibited. If you have received this document in error, please immediately notify us by telephone to arrange for its return. Thank you.

Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Honesty Environmental Services, Inc.	Date Sampled: 04/10/2024
14420 W Sylvanfield Drive, Suite #200	Date Received: 04/11/2024
Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-01			MA-02			MA-03		
Location	Exterior			Corridor - (A100) - North End			Corridor - (A112) - South End		
Lab Sample ID	H-240411020-090			H-240411020-091			H-240411020-092		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments							2	13	
Pollen	1	7							
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)							2	13	1
Ascospores	512	3413	78	128	853	39	32	213	19
Basidiospores	100	667	15	52	347	16	20	133	12
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	12	80	2	40	267	12	8	53	5
Colorless/Other Brown*							1	7	1
Curvularia				1	7	<1	3	20	2
Epicoccum							1	7	1
Fusarium									
Memnoniella									
Nigrospora				3	20	1	2	13	1
Oidium									
Penicillium/Aspergillus	32	213	5	104	693	32	96	640	57
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy				1	7	<1	2	13	1
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula									
Zygomycetes									
Background debris (1-5)**	2			2			3		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	656	**4370**		329	**2190**		167	**1110**	

Comments:

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The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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***Ulocladium has been recognized by the International Mycological Association to be equal to Alternaria and so they are reported as one.

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This report relates only to the samples tested as they were received.

Respectfully submitted, SEEML

410 W Grand Pkwy S, Suite 250
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Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

Spore Trap Report

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14420 W Sylvanfield Drive, Suite #200	Date Received: 04/11/2024
Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-04			MA-05			MA-06		
Location	Day Room - (A106) - North End			Day Room - (A106) - South End			Group Room (A119)		
Lab Sample ID	H-240411020-093			H-240411020-094			H-240411020-095		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments				5	33		2	13	
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)									
Ascospores	116	773	47	36	240	44	112	747	60
Basidiospores	24	160	10	4	27	5	32	213	17
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	24	160	10	16	107	20	4	27	2
Colorless/Other Brown*									
Curvularia	1	7	<1				1	7	1
Epicoccum									
Fusarium									
Memnoniella									
Nigrospora	1	7	<1						
Oidium									
Penicillium/Aspergillus	80	533	32	24	160	29	36	240	19
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy	1	7	<1	2	13	2	1	7	1
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula							2	13	1
Zygomycetes									
Background debris (1-5)**	2			3			2		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	247	**1650**		82	**547**		188	**1250**	

Comments:

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The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

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Respectfully submitted, SEEML

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Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

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Spore Trap Report

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	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-07			MA-08			MA-09		
Location	Corridor - (C100) - North End			Corridor - (C112) - South End			Day Room - (C106) - North End		
Lab Sample ID	H-240411020-096			H-240411020-097			H-240411020-098		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments				1	7				
Pollen	1	7		1	7		1	7	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)				1	7	<1			
Ascospores	184	1227	41	264	1760	40	336	2240	36
Basidiospores	120	800	27	80	533	12	128	853	14
Bipolaris/Drechslera	2	13	<1	1	7	<1			
Cercospora									
Chaetomium									
Cladosporium	24	160	5	160	1067	24	136	907	15
Colorless/Other Brown*									
Curvularia							1	7	<1
Epicoccum							1	7	<1
Fusarium									
Memnoniella									
Nigrospora	6	40	1	4	27	1			
Oidium									
Penicillium/Aspergillus	112	747	25	144	960	22	328	2187	35
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy	1	7	<1				2	13	<1
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula									
Zygomycetes									
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	449	**2990**		654	**4360**		932	**6210**	

Comments:

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Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

Spore Trap Report

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	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-10			MA-11			MA-12		
Location	Day Room - (C106) - South End			Office (C120)			Corridor - (D100) - North End		
Lab Sample ID	H-240411020-099			H-240411020-100			H-240411020-101		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments									
Pollen	1	7							
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)									
Ascospores	216	1440	48	256	1707	39	96	640	67
Basidiospores	40	267	9	96	640	15	16	107	11
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	24	160	5	120	800	18	8	53	6
Colorless/Other Brown*									
Curvularia	1	7	<1						
Epicoccum				1	7	<1			
Fusarium									
Memnoniella									
Nigrospora				1	7	<1			
Oidium									
Penicillium/Aspergillus	160	1067	36	176	1173	27	24	160	17
Pithomyces	1	7	<1						
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy	6	40	1	2	13	<1			
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula									
Zygomycetes									
Background debris (1-5)**	3			3			2		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	448	**2990**		652	**4350**		144	**960**	

Comments:

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Houston,TX,77014	Date Analyzed: 04/11/2024
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	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-13			MA-14			MA-15		
Location	Corridor - (D109) - South End			Day Room - (D106) - North End			Day Room - (D106) - South End		
Lab Sample ID	H-240411020-102			H-240411020-103			H-240411020-104		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments							1	7	
Pollen				1	7				
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)									
Ascospores	56	373	58	24	160	32	52	347	54
Basidiospores	16	107	17	16	107	21	12	80	12
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium				28	187	37	24	160	25
Colorless/Other Brown*									
Curvularia									
Epicoccum									
Fusarium									
Memnoniella									
Nigrospora									
Oidium									
Penicillium/Aspergillus	24	160	25	8	53	11	8	53	8
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula									
Zygomycetes									
Background debris (1-5)**	2			2			2		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	96	**640**		76	**507**		96	**640**	

Comments:

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	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-16			MA-17			MA-18		
Location	Office (D121)			Corridor - (B100) - North End			Corridor - (B109) - South End		
Lab Sample ID	H-240411020-105			H-240411020-106			H-240411020-107		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments							1	7	
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)	1	7	1						
Ascospores	44	293	59	40	267	58	56	373	53
Basidiospores				12	80	17	24	160	23
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	16	107	22	12	80	17	12	80	11
Colorless/Other Brown*									
Curvularia									
Epicoccum									
Fusarium									
Memnoniella									
Nigrospora							1	7	1
Oidium									
Penicillium/Aspergillus	12	80	16	4	27	6	12	80	11
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy	1	7	1				1	7	1
Spegazzinia									
Stachybotrys									
Tetraploa				1	7	1			
Torula									
Zygomycetes									
Background debris (1-5)**	2			2			2		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	74	**494**		69	**461**		106	**707**	

Comments:

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	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-19			MA-20			MA-21		
Location	Day Room - (B106) - North End			Day Room - (B106) - South End			Office (B122)		
Lab Sample ID	H-240411020-108			H-240411020-109			H-240411020-110		
Detection Limit (spores/m^3)	7			7			7		
Hyphal Fragments	3	20		2	13		3	20	
Pollen	2	13					1	7	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria (=Ulocladium)									
Ascospores	208	1387	71	128	853	64	88	587	53
Basidiospores	32	213	11	4	27	2	20	133	12
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	32	213	11	20	133	10	20	133	12
Colorless/Other Brown*									
Curvularia							2	13	1
Epicoccum									
Fusarium									
Memnoniella									
Nigrospora	1	7	<1	2	13	1	3	20	2
Oidium									
Penicillium/Aspergillus	20	133	7	44	293	22	32	213	19
Pithomyces									
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy				1	7	1	2	13	1
Spegazzinia									
Stachybotrys									
Tetraploa	1	7	<1						
Torula									
Zygomycetes									
Background debris (1-5)**	2			2			2		
Sample Volume(liters)	150			150			150		
TOTAL SPORES/M^3	294	**1960**		199	**1330**		167	**1110**	

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

***Ulocladium has been recognized by the International Mycological Association to be equal to Alternaria and so they are reported as one.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.

This report relates only to the samples tested as they were received.

Respectfully submitted, SEEML

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Phone: 832-437-2667

Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

Spore Trap Report

Honesty Environmental Services, Inc.	Date Sampled: 04/10/2024
14420 W Sylvanfield Drive, Suite #200	Date Received: 04/11/2024
Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State, ZIP: Beaumont, TX
	SEEML Reference # : H-240411020

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	MA-22			MA-23					
Location	Control Rm			Exterior					
Lab Sample ID	H-240411020-111			H-240411020-112					
Detection Limit (spores/m^3)	7			7					
Hyphal Fragments				1	7				
Pollen	2	13		1	7				
Spore Trap Used	AOC			AOC					
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%			
Alternaria (=Ulocladium)									
Ascospores	16	107	48	552	3680	69			
Basidiospores	4	27	12	224	1493	28			
Bipolaris/Drechslera									
Cercospora									
Chaetomium									
Cladosporium	4	27	12	12	80	2			
Colorless/Other Brown*									
Curvularia									
Epicoccum									
Fusarium									
Memnoniella									
Nigrospora				1	7	<1			
Oidium									
Penicillium/Aspergillus	8	53	24	8	53	1			
Pithomyces	1	7	3						
Polythrincium									
Pyricularia									
Rusts									
Smuts/Periconia/Myxomy									
Spegazzinia									
Stachybotrys									
Tetraploa									
Torula									
Zygomycetes									
Background debris (1-5)**	2			2					
Sample Volume(liters)	150			150					
TOTAL SPORES/M^3	33	**221**		797	**5310**				

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3. The limit of detection is the analytical sensitivity (in spores/m^3) multiplied by the sample volume (in liters) divided by 1000 liters.

*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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This report relates only to the samples tested as they were received.

Respectfully submitted, SEEML

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Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory AIHA LAP, LLC EMLAP #173667 Texas Lic: LAB1016

Surface and Bulk Sample Report

Honesty Environmental Services, Inc.	Date Sampled: 04/10/2024
14420 W Sylvanfield Drive, Suite #200	Date Received: 04/11/2024
Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State ZIP: Beaumont, TX
	SEEML Reference #: H-240411020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	T-01	T-02	T-03	T-04
Location	POD4A - Green Door (Metal)	POD4A - Beige Door (Metal)	POD4A - CMU Block	Office - Drywall
SEEML Sample ID	H-240411020-113	H-240411020-114	H-240411020-115	H-240411020-116
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**L**	**L**	**VL**	**L**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Miscellaneous Spores				
Fungal Growth:				
Acremonium			**L**	
Alternaria (=Ulocladium)				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**H**	**H**	**H**	**H**
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium				
Penicillium/Aspergillus	**M**	**L**	**VL**	
Pithomyces				
Rusts				
Stachybotrys				
Torula				
Trichoderma				

Revisions:

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

Ulocladium has been recognized by the International Mycological Association to be equal to Alternaria and so they are reported as one.

Quantification of fungal growth is done by semi-quantitative grading using the following ranges:

Scattered Spores = 1-20 fungal spores

VL = 21-100 fungal spores **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

ND = No Fungal Spores Detected

Disclaimer: This report relates only to the samples tested as received.

Respectfully submitted, SEEML

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Phone: (832) 437-2667

AIHA LAP, LLC EMLAP #232339
Texas Lic: LAB1016
Form 46.0 Rev 5 02/03/22

Surface and Bulk Sample Report

Honesty Environmental Services, Inc.	Date Sampled: 04/10/2024
14420 W Sylvanfield Drive, Suite #200	Date Received: 04/11/2024
Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State ZIP: Beaumont, TX
	SEEML Reference #: H-240411020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	T-05	T-06	T-07	T-08
Location	POD4C - CMU Block	POD4C - Metal Green Door Frame	POD4C - Office - Drywall	POD4C - Metal Beige Door Frame
SEEML Sample ID	H-240411020-117	H-240411020-118	H-240411020-119	H-240411020-120
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**VL**	**L**	**L**	**L**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Miscellaneous Spores				
Fungal Growth:				
Acremonium	**L**			**L**
Alternaria (=Ulocladium)				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**H**	**M**	**H**	**H**
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium		**H**		
Penicillium/Aspergillus	**L**		**M**	**L**
Pithomyces				
Rusts				
Stachybotrys				
Torula				
Trichoderma				

Revisions:

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Houston,TX,77014	Date Analyzed: 04/11/2024
(713) 856-5354	Date Reported: 04/11/2024
	Date Revised:
	Project Name: 248-1980-15118 Diversion Center
	Project Address: 3890 FM 3514
	Project City, State ZIP: Beaumont, TX
	SEEML Reference #: H-240411020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	T-09	T-10	T-11	T-12
Location	Control Room - Metal Beige Door	Control Room - Metal Window Frame	POD4D - Beige Door (Metal)	POD4D - CMU Block
SEEML Sample ID	H-240411020-121	H-240411020-122	H-240411020-123	H-240411020-124
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**L**	**L**	**VL**	**L**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Miscellaneous Spores				
Fungal Growth:				
Acremonium	**VL**	**VL**		
Alternaria (=Ulocladium)				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**H**	**H**	**H**	**H**
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium				
Penicillium/Aspergillus	**VL**	**L**	**L**	**M**
Pithomyces				
Rusts				
Stachybotrys				
Torula				
Trichoderma				

Revisions:

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	Project City, State ZIP: Beaumont, TX
	SEEML Reference #: H-240411020

TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)

Client Sample ID	T-13	T-14	T-15	T-16
Location	POD4D - Green Door	POD4B - Metal Green Door Frame	POD4B - Metal Beige Door Frame	POD4B - Window Frame
SEEML Sample ID	H-240411020-125	H-240411020-126	H-240411020-127	H-240411020-128
Sample Type	Tape	Tape	Tape	Tape
	Quantification*	Quantification*	Quantification*	Quantification*
Hyphal Fragments	**L**	**L**	**L**	**VL**
Pollen				
General Impressions **	**FG**	**FG**	**FG**	**FG**
Miscellaneous Spores				
Fungal Growth:				
Acremonium		**L**		
Alternaria (=Ulocladium)				
Ascospores				
Basidiospores				
Bipolaris/Drechslera				
Cercospora				
Chaetomium				
Cladosporium	**L**	**H**	**H**	**H**
Curvularia				
Epicoccum				
Fusarium				
Geotrichum sp.				
Memnoniella				
Myxomycetes				
Nigrospora				
Penicillium				
Penicillium/Aspergillus	**H**	**L**	**H**	**VL**
Pithomyces				
Rusts				
Stachybotrys				
Torula				
Trichoderma				

Revisions:

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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis.

The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Aureobasidium

Aureobasidium pullulans is a ubiquitous and generalistic black, yeast-like fungus that can be found in different environments (e.g., soil, water, air, and limestone). It is well known as a naturally occurring epiphyte or endophyte of a wide range of plant species (e.g. apple, grape, cucumber, green beans, cabbage) without causing any symptoms of disease. *A. pullulans* has a high importance in biotechnology for the production of different enzymes, siderophores and pullulan. Furthermore, *A. pullulans* is used in biological control of plant diseases, especially storage diseases.
Chronic human exposure to *A. pullulans* via humidifiers or air conditioners can lead to hypersensitivity pneumonitis (extrinsic allergic alveolitis) or "humidifier lung". This condition is characterized acutely by dyspnea, cough, fever, chest infiltrates, and acute inflammatory reaction. The condition can also be chronic, and lymphocyte mediated. The chronic condition is characterized radiographically by reticulonodular infiltrates in the lung, with apical sparing. The strains causing infections in humans were reclassified to *A. melanogenum.*

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Botrytis sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

Large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*- like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys* . Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum* . No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Sporotrichum

Sporotrichum species comprise a very small proportion of the fungal biota and are most closely related to other colorless hyphomycetes such as Chrysosporium. The only information available regarding health effects are a few rare cases of repeated isolations from respiratory secretions suggestive of bronchopulmonary colonization. No information is available regarding toxicity. Allergenicity has not been studied. May be identified on surfaces by tape lifts, tease mounts from bulk samples, and in air by culturable (Andersen) samples. Many times sporulating colorless fungi are very difficult to identify, with critical structures only very faintly visible under oil immersion magnification. Thus, these isolates may be placed in the category "Colorless, sporulating, ID unknown" on the Andersen report format. Spores do not have distinctive morphology and would be categorized as "other colorless" on spore trap samples. Natural habitat includes soil and decaying wood.

Stachybotrys sp.

Aw - 0.94, optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum* , *Circinella* , *Mortierella* , *Mycotypha* , *Cunninghamella* , and *Choanephora* . For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
Acremonium crotocinigenum	Crotocin
Aspergillus favus	Alfatoxin B, cyclopiazonic acid
Aspergillus fumigatus	Fumagilin, gliotoxin
Aspergillus carneus	Critrinin
Aspergillus clavatus	Cytochalasin, patulin
Aspergillus Parasiticus	Alfatoxin B
Aspergillus nomius	Alfatoxin B
Aspergillus niger	Ochratoxin A, malformin, oxalicacid
Acremonium crotocinigenum	Crotocin
Aspergillus nidulans	Sterigmatocystin
Aspergillus ochraceus	Ochratoxin A, penicillic acid
Aspergillus versicolor	Sterigmatocystin, 5 ethoxysterigmatocystin
Aspergillus ustus	Ausdiol, austamide, austocystin,brevianamide
Aspergillus terreus	Citreoviridin
Alternaria	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
Arthrinium	Nitropropionic acid
Bioploaris	Cytochalasin, sporidesmin, sterigmatocystin
Chaetomium	Chaetoglobosin A,B,C. Sterigmatocystin
Cladosporium	Cladosporic acid
Clavipes purpurea	Ergotism
Cylindrocorpon	Trichothecene
Diplodia	Diplodiatoxin
Fusarium	Trichothecene, zearalenone
Fusarium moniliforme	Fumonisins
Emericella nidulans	Sterigmatocystin
Gliocladium	Gliotoxin
Memnoniella	Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol
Myrothecium	Trichothecene
Paecilomyces	Patulin, viriditoxin
Penicillium aurantiocandidum	Penicillic acid
Penicillium aurantiogriseum	Penicillic acid
Penicillium brasilanum	Penicillic acid
Penicillium brevicompactum	Mycophenolic acid
Penicillium camemberti	Cyclopiazonic acid
Penicillium carneum	Mycophenolic acid, Roquefortine C
Penicillium crateriforme	Rubratoxin

Fungi	Mycotoxin
Penicillium citrinum	Citrinin
Penicillium commune	Cyclopiazonic acid
Penicillium crustosum	Roquefortine C
Penicillium chrysogenum	Roquefortine C
Penicillium discolor	Chaetoglobosin C
Penicillium expansum	Citrinin, Roquefortine C
Penicillium griseofulvum	Roquefortine C, cyclopiazonic acid, griseofulvin
Penicillium hirsutum	Roquefortine C
Penicillium hordei	Roquefortine C
Penicillium nordicum	Ochratoxin A
Penicillium paneum	Roquefortine C
Penicillium palitans	Cyclopiazonic acid
Penicillium polonicum	Penicillic acid
Penicillum roqueforti	Roquefortine C, Mycophenolic acid
Penicillium veridicatum	Penicillic acid
Penicillium verrucosum	Citrinin, ochratoxin A
Penicillium/ Aspergillus	Patulin
Penicillium/ Aspergillus/Alternaria	Glitoxin
Phomopsis	Macrocyclic trichothecenes
Phoma	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
Pithomyces	Sporidesmin
Rhizoctonia	Slaframine
Rhizopus	Rhizonin
Sclerotinia	Furanocoumarins
Stachybotrys chartarum	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
Torula	Cytotoxins
Trichoderma	Trichodermin, trichodermol, gliotoxin
Trichothecium	Trichothecene
Wallemia	Walleminol
Zygosporium	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum* . While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys* .

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

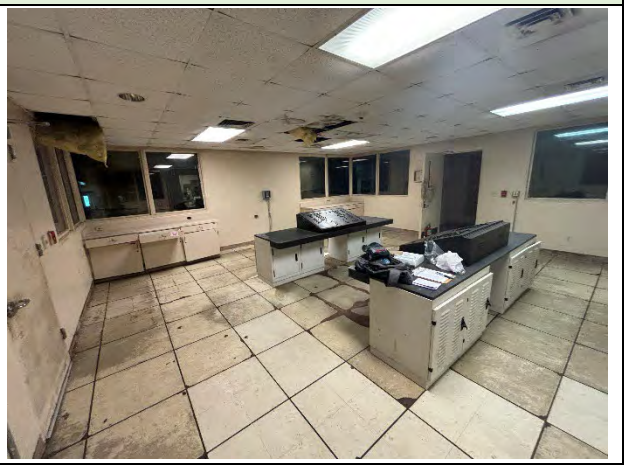
The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.

PHOTOGRAPHS

Exterior View of Facility	**Visible Mold Growth on Metal Window Frame**
Visible Mold Growth on Green Door	**Visible Mold Growth on Green Door**
Visible Mold Growth on Drywall	**Visible Mold Growth on Drywall**

Visible Mold Growth on Beige Door	**Visible Mold Growth on Beige Door**
Visible Mold Growth on CMU Wall	**Visible Mold Growth on Green Door Frame**
	
Visible Mold Growth on Beige Door Frame	**Control Center**

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Mold Assessment Consultant

JARROLD ARDOIN

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License Expires: August 23, 2025

Mike Arismendez, Jr.
Executive Director

TEXAS CONSUMER MOLD INFORMATION SHEET

CONSUMER MOLD INFORMATION SHEET

State rules require licensed mold assessors and remediators to give a copy of this Consumer Mold Information Sheet to each client and to the property owner, if not the same person, before starting any mold-related activity [16 TAC 78.70].

How does Texas regulate businesses that do testing for mold or that do mold cleanup?
The Department of Licensing and Regulation (TDLR) regulates such businesses in accordance with the Texas Occupations Code, Chapter 1958. Under the **Texas Mold Assessment and Remediation Rules (rules)** (16 Tex. Admin. Code, Chapter 78), all companies and individuals who perform mold-related activities in Texas must be licensed by TDLR unless exempt. (See Page 2 regarding owner exemptions.) Individuals must meet certain qualifications, have required training, and pass a state exam and criminal history background check in order to be issued a license. Applicants for a mold remediation worker registration must have training and pass a criminal history background in order to be registered by TDLR. Laboratories that analyze mold samples must also be licensed and meet certain qualifications. The rules set minimum work practices and procedures and also require licensees to follow a code of ethics. To prevent conflicts of interest, the rules also prohibit a licensee from conducting both mold assessment and mold remediation on the same project. While the rules regulate the activities of mold licensees when they are doing mold-related activities, the rules do not require any property owner or occupant to clean up mold or to have it cleaned up.

How can I know if someone is licensed?
A licensed individual is required to carry a current TDLR license certificate with the license number on it. A search tool and listings of currently licensed companies and individuals can be found at: https://www.tdlr.texas.gov/LicenseSearch/.

What is "mold assessment?"
Mold assessment is an inspection of a building by a **mold assessment consultant** or **technician** to evaluate whether mold growth is present and to what extent. Samples may be taken to determine the amount and types of mold that are present; however, sampling is not necessary in many cases. When mold cleanup is necessary a licensed mold assessment consultant can provide you with a **mold remediation protocol.** A protocol must specify the estimated quantities and locations of materials to be remediated, methods to be used and clearance criteria that must be met.

What is meant by "clearance criteria?"
Clearance criteria refer to the level of "cleanliness" that must be achieved by the persons conducting the mold cleanup. It is important to understand and agree with the mold assessment consultant prior to starting the project as to what an acceptable clearance level will be, including what will be acceptable results for any air sampling or surface sampling for mold. There are no national or state standards for a "safe" level of mold. Mold spores are a natural part of the environment and are always present at some level in the air and on surfaces all around us.

What is "mold remediation?"
Mold remediation is the cleanup and removal of mold growth from surfaces and/or contents in a building. It also refers to actions taken to prevent mold from growing back. Licensed **mold remediation contractors** must follow a mold remediation protocol as described above and their own **mold remediation work plan** that provides specific instructions and/or standard operating procedures for how the project will be done.

Before a remediation project can be deemed successful, a mold assessment consultant must conduct a **post-remediation assessment.** This is an inspection to ensure that the work area is free from all visible mold and wood rot, the project was completed in compliance with the remediation protocol and remediation work plan, and that it meets all clearance criteria that were specified in the protocol. The assessment consultant must give you a **passed clearance report** documenting the results of this inspection. If the project fails clearance,

further remediation as prescribed by a consultant will be necessary.

What is a Certificate of Mold Damage Remediation?

No later than the 10th day after a mold remediation project stop date, the remediation contractor must sign and give you a **Certificate of Mold Damage Remediation**. The licensed mold assessment consultant who conducted the post-remediation assessment must also sign the certificate. The consultant must truthfully state on the certificate that the mold contamination identified for the project has been remediated and whether the underlying cause of the mold has been corrected. (That work may involve other types of professional services that are not regulated by the mold rules, such as plumbing or carpentry.) Receiving a certificate documenting that the underlying cause of the mold was remediated is an advantage for a homeowner. It prevents an insurer from making an underwriting decision on the residential property based on previous mold damage or previous claims for mold damage. If you sell your property, the law requires that you provide the buyer a copy of all certificates you have received for that property within the preceding five years.

How is a property owner protected if a mold assessor or remediator does a poor job or damages the property?

The rules require licensees to have commercial general liability insurance in the amount of at least $1 million, or to be self-insured, to cover any damage to your property. Before hiring anyone, you should ask for proof of such insurance coverage. You may wish to inquire if the company carries additional insurance, such as professional liability/errors and omissions (for consultants) or pollution insurance (for contractors), that would provide additional recourse to you should the company fail to perform properly.

How is my confidentiality protected if I share personal information about myself with a company?

Under the code of ethics in the rules, to the extent required by law, licensees must keep confidential any personal information about a client (including medical conditions) obtained during the course of a mold-related activity. Further, you may be able to negotiate a contract to include language that other personal information be kept confidential unless disclosure "is required by law." However, licensees are required to identify dates and addresses of projects and other details that can become public information.

How do I file a complaint about a company?

Anyone who believes a company or individual has violated the rules can file a complaint with TDLR. For information on this process, call 1-800-803-9202, or complete the online complaint form at https://www.tdlr.texas.gov/complaints/.

Can property owners do mold assessment or remediation on their own property without being licensed?

Yes. A homeowner can take samples for mold or clean it up in the home without a license. An owner, or a managing agent or employee of an owner of a residential property is not required to be licensed, **unless** the property has 10 or more residential dwelling units. For non-residential properties, an owner or tenant, or a managing agent or employee of an owner or tenant, is not required to be licensed to do mold assessment or remediation on property owned or leased by the owner or tenant, **unless** the mold contamination affects a total surface area of 25 contiguous square feet or more. Please refer to 16 TAC §78.30 for further details on exceptions and exemptions to licensing requirements.

For more information about mold and the Texas Mold Assessment and Remediation Rules, contact:
Texas Department of Licensing and Regulation
Mold Assessors and Remediators
PO Box 12057, Austin, TX 78711
Phone: 512-463-6599 or 800-803-9202
www.tdlr.texas.gov

GEOTECHNICAL INVESTIGATION

DIVERSION CENTER DRIVEWAY

Beaumont, Texas

PREPARED FOR:

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Jefferson County
1149 Pearl Street, 7th Floor
Beaumont, Texas 77701

PREPARED BY:

Atlas Technical Consultants, LLC
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July 2, 2024
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July 2, 2024 Atlas No. 240296

Mistey Reeves
Jefferson County
1149 Pearl Street, 7th Floor
Beaumont, Texas 77701

Subject: **Geotechnical Investigation**
Diversion Center Driveway
3890 FM 3514
Beaumont, Texas

In compliance with your instructions, Atlas Technical Consultants, LLC (Atlas) has conducted a geotechnical investigation for the above referenced development. Fieldwork for this investigation was conducted on June 13, 2024. Data have been analyzed to evaluate pertinent geotechnical conditions. Results of this investigation, together with our recommendations, are to be found in the following report. We have provided a PDF copy for your review and distribution.

Often, questions arise concerning soil conditions because of design and construction details that occur on a project. Atlas would be pleased to continue our role as geotechnical engineers during project implementation.

If you have any questions, please call us at (409) 299-9550.

Respectfully submitted,

Atlas Technical Consultants, LLC
TBPE Firm Registration No. F-19813

STATE OF TEXAS
ADAM J. HEIMAN
106047
LICENSED
PROFESSIONAL ENGINEER
7/2/2024

Logan McKee, P.E.
Staff Engineer
LM/AJH

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Distribution: *Jefferson County (PDF Copy)*

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1.0 INTRODUCTION

This report presents results of a geotechnical investigation and analysis in support of data utilized in design of pavements. Information in support of groundwater and stormwater issues pertinent to the practice of Civil Engineering is included. Observations and recommendations relevant to the earthwork phase of the project are also presented. Revisions in plans or drawings for the proposed development from those enumerated in this report should be brought to the attention of the soils engineer to determine whether changes in the provided recommendations are required. Deviations from noted subsurface conditions, if encountered during construction, should also be brought to the attention of the soils engineer.

1.1 Project Description

The proposed development will consist of the construction of a new driveway for the existing Diversion Center located in Beaumont, Texas. Site maps included in the **Appendix** show the project location. We also understand that the new pavements will consist of Portland cement concrete sections and will be designed using the 1993 AASHTO pavement design method.

Drainage is expected to be directed to onsite infiltration facilities. The location of the infiltration facilities is unknown at this time. Atlas has not been informed of the proposed grading plan. Therefore, we have assumed final grades will be within 2-feet of existing grades.

1.2 Scope of Investigation

Our scope of work was completed in general accordance with our proposal (Atlas No. 24-05140) dated May 6, 2024, and authorized under Jefferson County PO Number 092304 dated May 28, 2024. Said authorization is subject to terms, conditions, and limitations described in the Client Services Agreement entered between Jefferson County and Atlas.

Atlas' scope of services included the following:

- Subsurface exploration via borings.
- Field and laboratory testing of materials encountered and collected.
- Recommendations for pavement sections.
- Preparation of this report, which includes project description, site conditions, and our engineering analysis and evaluation for the project.

2.0 SITE DESCRIPTION

2.1 Regional Geology

The Geologic Map of Texas, published by the University of Texas at Austin, Bureau of Economic Geology, has mapped the Beaumont Formation (Qb-stipled) in the general area of the project site. Beaumont Formation generally consists of clays and mud.

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2.2 General Site Characteristics

The following details regarding site conditions are based on visual observations and review of available geologic and topographic maps and imagery:

- **Current Site Conditions:** The site is currently developed with buildings and pavements.
- **Vegetation:** Vegetation on the site consists primarily of native weeds and grasses.
- **Topography:** The site is relatively flat and level.
- **Drainage:** Stormwater drainage for the site is achieved by both sheet runoff and percolation through surficial soils. The site is situated so that it is unlikely that it will receive any drainage from off-site sources.

3.0 SOILS EXPLORATION

3.1 Exploration and Sampling Procedures

Field exploration conducted to determine engineering characteristics of subsurface materials included a reconnaissance of the project site and investigation by drilling a total of seven borings to a depth of about 6 feet. The corresponding location of each boring is provided in **Table 1**.

Table 1 – Boring Information

Boring Locations	Boring No.	Boring Depth, feet
Proposed Driveway	B-1 to B-3	10

The boring locations were located in the field by means of a Global Positioning System (GPS) device and are reportedly accurate to within 25 feet. Borings were advanced by means of a buggy drilling rig equipped with continuous straight flight augers. At specified depths, samples were obtained by the thin-walled tube sampling procedure. In the thin-walled tube sampling procedure, a thin-walled, seamless tube with a sharp cutting edge is pushed hydraulically into the ground to obtain relatively undisturbed samples of cohesive or moderately cohesive soils in general accordance with ASTM Standard D 1587. These values are indicated on the borings logs at the depths of occurrence. The samples were sealed and transported to the laboratory for testing and classification.

Samples have been visually classified in the field, identified according to boring number and depth, placed in sealed containers, and transported to our laboratory for additional testing. Subsurface materials have been described in detail on logs provided in the **Appendix**. Results of field and laboratory tests are also presented in the **Appendix**. Atlas recommends that these logs not be used to estimate fill material quantities.

3.2 Laboratory Testing Program

Along with our field investigation, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of subsurface materials. Laboratory tests were conducted in accordance with current specifications. Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS)

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described in the **Appendix**. At that time, the field descriptions were confirmed or modified as necessary, and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented on the boring logs presented in the **Appendix**. The laboratory test results were used for the geotechnical engineering analyses, and the development of pavements and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

3.3 Soil and Sediment Profile

The profile below represents a generalized interpretation for the project site. Note that on site soils strata, encountered between boring locations, may vary from the individual soil profiles presented in the logs.

Table 2 – Typical Soil Profiles

Soil Horizons	Approximate Depths	Soil Types	Consistency/Relative Density
Surficial Soils	0 to 6 feet	Lean Clay, Fat Clay	Medium Stiff to Very Stiff
Intermediate Soils	2 to 10 feet	Fat Clay	Medium Stiff to Very Stiff

During excavation, boring sidewalls were generally stable. However, moisture contents will affect wall competency with saturated soils having a tendency to readily slough when under load and unsupported.

3.4 Expansive Soil Considerations

High-plasticity clay (CH) soils present across the site are active and will be subject to volumetric change with fluctuations in moisture content. Such movement will most often be associated with seasonal moisture variation of clayey soils. Ground-supported improvements (i.e., shallow foundations, slabs and pavements) founded on clay soils will move in response to changes in soil moisture. Movement will be observed as heave if construction occurs when soils are relatively dry then subsequently become wet, and conversely, movement will be observed as settlement if construction occurs when soils are relatively moist and are then allowed to dry.

Based on our findings, the subsurface soils at this site generally exhibit a moderate to high expansion potential. Based on the information developed from our field and laboratory programs and on method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, we estimate that the subgrade soils at this site exhibit a Potential Vertical Rise (PVR) to range between 4 to 5 inches in its present condition.

3.5 Volatile Organic Scan

Soils obtained during on-site activities were not assessed for volatile organic compounds by portable photoionization detector. Samples obtained during our exploration activities exhibited

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no apparent odors or discoloration typically associated with this type of contamination. No groundwater was encountered.

4.0 SITE HYDROLOGY

Existing surface drainage conditions are defined in the **General Site Characteristics** section. Information provided in this section is limited to observations made at the time of the investigation. Either regional or local ordinances may require information beyond the scope of this report.

4.1 Groundwater

During this field investigation, groundwater was not encountered in the borings advanced to a maximum depth of six feet below the existing ground surface. However, it is common to detect seasonal groundwater from natural fractures within the clayey matrix particularly during or after periods of precipitation.

It is not possible to accurately predict the magnitude of groundwater fluctuations that might occur based upon short-term observations. The occurrence and variation of groundwater can vary due to many factors. These factors include seasonal changes, site topography, surface runoff, the layering and permeability of subsurface strata, water levels in waterways, utilities, and other factors not evident at the time of this study. The possibility of groundwater and its fluctuation should be considered when developing this project.

4.2 Soil Infiltration Rates

Soil permeability, which is a measure of the ability of a soil to transmit a fluid, was not tested in the field. Given the absence of direct measurements, for this report an estimation of infiltration is presented using generally recognized values. Typical infiltration rates comprising the generalized soil profile for this study have been provided in the table below.

Table 3 – Generalized Soil Infiltration Rates

USCS Soil Types [1]	Typical Infiltration Rate (inches per hour)
CH, CL, ML, MH	<2
SC, GC, GP-GC, SP-SC	2 to 6
SM, GM	4 to 8
GP-GM, SP-SM	6 to 10
SP, GP, SW, SP	>12

[1] *See Unified Soil Classification System (USCS) provided in the Geotechnical General Notes in the **Appendix** for soil descriptions.*

[2] *The presence of cementation/induration may reduce infiltration rates to near zero.*

[3] *Infiltration into rock and/or within close proximity to groundwater may reduce infiltration rates to near zero.*

It is recommended that infiltration facilities constructed on the site be extended into native clays. An infiltration rate of 2 inches per hour should be used in design for the native clays at this site.

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Actual infiltration rates should be confirmed at the time of construction. Atlas recommends that all infiltration facilities be constructed in accordance with the local municipality requirements.

5.0 SLOPES AND SETBACKS

Native slopes on the site were roughly 5 feet horizontal to 1 foot vertical (5:1) or flatter. Therefore, slope setback requirements as outlined in the 2018 IBC are not applicable. Our investigation did not reveal any potential visual slope instabilities.

6.0 PAVEMENT DISCUSSION AND RECOMMENDATIONS

Project specific traffic loading information has not been provided. Atlas anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. Based on the character of the proposed construction, Atlas has assumed a traffic loading of 75,000 ESALs for the proposed driveway. If heavier traffic loading is expected, Atlas should be provided with the information and allowed to review these pavement sections.

The recommended pavement sections provided below are based on a 20-year design life. The following are minimum thickness requirements for assured pavement function. Depending on site conditions, additional work, e.g. soil preparation, may be required to support construction equipment. These have been listed within the **Soft Subgrade Soils** section.

6.1 Rigid Pavement Sections

The American Association of State Highway and Transportation Officials (AASHTO) design method was used to develop the following rigid concrete pavement sections.

Table 4 – AASHTO Rigid Pavement Specifications

Pavement Section Component	Driveway (inches)	
Reinforced Portland Cement Concrete[1]	6.0	7.0
Lime Treated Subgrade	6.0	----
Recompacted Subgrade [2]	----	6.0

[1] *Refer to ACI 330 for additional information on pavement joints and reinforcement.*

[2] *It will be required for Atlas personnel to verify subgrade competency at the time of construction.*

6.2 Pavement Material Specifications

Presented below are selection and preparation guidelines for various materials that may be used to construct the pavement sections. Submittals should be made for each pavement material. The submittals should be reviewed by the Geotechnical Engineer and appropriate members of the design team and should provide test information necessary to verify full compliance with the recommended or specified material properties.

- Reinforced Portland Cement Concrete - Concrete should have a minimum 28-day design compressive strength of 4,000 psi. Concrete should be designed with 5 + 1 percent

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entrained air. Joints in concrete paving should not exceed 15 feet. Reinforcing steel should consist of No. 3 bars placed at 18 inches on-center in two directions.

- Lime Stabilized Subgrade – The subgrade should be scarified to a depth of 6 inches and mixed with a minimum 7 percent hydrated lime (by dry soil weight) in conformance with TxDOT Standard Specification Item 260. The soil-lime mixture should be compacted to at least 95 percent as determined by ASTM D698 and within the range of 0 to 4 percentage points of optimum. **In addition, the clay soils at the final pavement subgrade should be tested for the presence of soluble sulfates prior to the use of lime.** Subgrade preparation utilizing lime stabilization as described herein will not prevent normal seasonal movement of the underlying untreated materials.
- Recompacted Subgrade - The subgrade should be scarified to a depth of 6 inches and compacted to a dry density of at least 95 percent as determined by ASTM D698 and within the range of 0 to +4 percentage points of optimum.

6.3 Pavement Subgrade Preparation

Native clay soils are moderately plastic and will be susceptible to shrink/swell movements associated with moisture changes. Areas of the site within the proposed pavement sections should be excavated to sufficient depths to expose clay soils. The clay soils should be scarified to a depth of 6 inches and compacted to a dry density of at least 95 percent as determined by ASTM D698. The moisture content should be within the range of 0 to +4 percentage points of optimum.

It is recommended that subgrade preparation extend at least 1 foot beyond the edge of the pavement to reduce effects of seasonal shrinking and swelling upon the extreme edges of pavement. Also, the curb should be constructed such that the base of the curb extends at least 6 inches into the pavement subgrade.

Pavement will have the same potential for movement as discussed in the **Expansive Soil Consideration** section. Good perimeter surface drainage with a minimum slope of 2 percent away from the pavement is recommended. Normal maintenance of pavement should be expected over the life of the pavement structures.

6.4 Common Pavement Section Construction Issues

The subgrade upon which above pavement sections are to be constructed must be properly stripped, compacted (if indicated), inspected, and proof-rolled. Proof rolling of subgrade soils should be accomplished using a heavy pneumatic tired roller, loaded dump truck or similar equipment weighing approximately 20 tons. Verification of subgrade competence by Atlas personnel at the time of construction is required. Fill materials on the site must demonstrate the indicated compaction prior to placing material in support of the pavement section. Atlas anticipated that pavement areas will be subjected to light traffic. Subgrade clayey soils near and above optimum moisture contents may pump during compaction. Pumping or soft areas must be removed and replaced with granular structural fill.

Fill material and aggregates, as well as compacted native subgrade soils, in support of the pavement section must be compacted to no less than 95 percent of the maximum dry density as

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determined by ASTM D698. If a material placed as a pavement section component cannot be tested by usual compaction testing methods, then compaction of that material must be approved by observed proof rolling. Minor deflections from proof rolling for flexible pavements are allowable. Deflections from proof rolling of rigid pavement support courses should not be visually detectable.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Earthwork

The following presents recommendations for general site preparation, excavation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including pavements are contingent upon following the recommendations outlined in this section. Earthwork on the project should be observed and evaluated by Atlas.

7.1.1 General Site Preparation

Excessively organic soils, deleterious materials, or disturbed soils generally undergo high volume changes when subjected to loads, which is detrimental to subgrade behavior in the area of pavements and flatwork. Weeds and thick grasses with associated root systems were noted at the time of our investigation. It is recommended that organic or disturbed soils, if encountered, be removed and wasted or stockpiled for later use. Stripping depths should be adjusted in the field to assure that the entire root zone or disturbed zone or topsoil are removed prior to placement and compaction of fill materials. Exact removal depths should be determined during grading operations by Atlas personnel, and should be based upon subgrade soil type, composition, and firmness or soil stability. If underground storage tanks, underground utilities, wells, or septic systems are discovered during construction activities, they must be decommissioned then removed or abandoned in accordance with governing Federal, State, and local agencies. Excavations developed as the result of such removal must be backfilled with fill materials as defined in the **Fill Material and Compaction** section.

All areas supporting pavement, flatwork, or areas to receive fill should be properly prepared.

- After completion of the necessary stripping, clearing, and excavating and prior to placing any required fill, the exposed soil subgrade should be carefully evaluated by probing and testing. Any undesirable material (organic material, wet, soft, or loose soil) still in place should be removed.
- The exposed soil subgrade should be further evaluated by proof-rolling with a heavy pneumatic tired roller, loaded dump truck or similar equipment weighing approximately 20 tons to check for pockets of soft or loose material hidden beneath a thin crust of possibly better soil. Any undesirable material exposed during proof-rolling operations should be removed and replaced with well-compacted material as outlined in the **Soft Subgrade Soils** and **Fill Material and Compaction** sections. *Note: Verification of subgrade competence should be observed by Atlas, or their designated representative at the time of construction.*

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- Prior to placement of any fill, the exposed soil subgrade should then be scarified to a minimum depth of 6 inches and recompacted as outlined **Fill Material and Compaction** section.

Atlas should oversee subgrade conditions (i.e., moisture content) as well as placement and compaction of new fill (if required) after native soils are excavated to design grade. Recommendations for structural fill presented in this report can be used to minimize volume changes and differential settlements. Sufficient density tests should be performed to properly monitor compaction.

7.2 Grading

Positive grades must be maintained surrounding pavements, including exterior flatwork. The interface of plant bedding materials and underlying soils should be graded to provide drainage away from site elements. Otherwise, bedding materials may direct water to underlying fine-grained soils, which increases the potential for localized heave. Excessive watering of landscaping should be avoided.

7.3 Dry Weather

If construction is to be conducted during dry seasonal conditions, many problems associated with soft soils may be avoided. However, some rutting of subgrade soils may be induced by shallow groundwater conditions related to springtime runoff or irrigation activities during late summer through early fall. Solutions to problems associated with soft subgrade soils are outlined in the **Soft Subgrade Soils** section. Problems may also arise because of lack of moisture in native soils and fill materials at time of placement. This will require the addition of water to achieve near-optimum moisture levels. Low-cohesion soils exposed in excavations may become friable, increasing chances of sloughing or caving. Measures to control excessive dust should be considered as part of the overall health and safety management plan.

7.4 Wet Weather

If construction is to be conducted during wet seasonal conditions (commonly from mid-November through May), problems associated with soft soils must be considered as part of the construction plan. During this time of year, fine-grained soils such as silts and clays will become unstable with increased moisture content, and eventually deform or rut. Additionally, constant low temperatures reduce the possibility of drying soils to near optimum conditions.

7.5 Soft Subgrade Soils

Shallow fine-grained subgrade soils that are high in moisture content should be expected to pump and rut under construction traffic. During periods of wet weather, construction may become very difficult if not impossible. The following recommendations and options have been included for dealing with soft subgrade conditions:

- Track-mounted vehicles should be used to strip the subgrade of root matter and other deleterious debris. Heavy rubber-tired equipment should be prohibited from operating

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directly on the native subgrade and areas in which fill materials have been placed. Construction traffic should be restricted to designated roadways that do not cross, or cross on a limited basis, proposed roadway or parking areas.

- Soft areas can be over-excavated and replaced with structural fill.
- Construction roadways on soft subgrade soils should consist of a minimum 2-foot thickness of large cobbles of 4 to 6 inches in diameter with sufficient sand and fines to fill voids. Construction entrances should consist of a 6-inch thickness of clean, 2-inch minimum, angular drain-rock and must be a minimum of 10 feet wide and 30 to 50 feet long. During the construction process, top dressing of the entrance may be required for maintenance.
- Scarification and aeration of subgrade soils can be employed to reduce the moisture content of wet subgrade soils. After stripping is complete, the exposed subgrade should be ripped or disked to a depth of 1½ feet and allowed to air dry for 2 to 4 weeks. Further disking should be performed on a weekly basis to aid the aeration process.
- Alternative soil stabilization methods include use of geotextiles, lime, and cement stabilization. Atlas is available to provide recommendations and guidelines at your request.

7.6 Fill Material and Compaction

All fill types (cohesive soils, granular soils and structural fill) should be placed in compacted lifts and moisture conditioned as described in this section. All fills should also be placed in thin, loose lifts not to exceed 8 inches, with compacted thickness of about 6 inches. The following fill materials and compaction recommendations are applicable for general site grading at this site. *Note: Imported soils used as general fill should consist of material with a PI not greater than 50 percent.*

- Structural Fill – Materials used as structural fill material should consist of a "non-expansive" material with a liquid limit less than 35 percent, a PI not less than about 5 percent or greater than 15 percent and contain no more than 0.5 percent fibrous organic materials, by weight. All structural fill material should contain no deleterious material and should be compacted to a dry density of at least 95 percent as determined by ASTM D698 and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content.
- General Fill (Clay) – Clay soils should be compacted to a dry density of at least 95 percent as determined by ASTM D698 and within the range of 1 to 4 percentage points above optimum. Clayey materials used as fill should be processed and the largest particle or clod should be less than 6 inches prior to compaction.
- General Fill (Granular) – Granular materials should be compacted to a dry density of at least 95 percent as determined by ASTM D698 and within the range of -2 to +2 percentage points of optimum.

Prior to placement of fill materials, surfaces must be prepared as outlined in the **General Site Preparation** section. Fill material must be placed in horizontal lifts not exceeding 6-inches in thickness. All fill material must be moisture-conditioned to achieve optimum moisture content prior to compaction. During placement all fill materials must be monitored and tested to confirm compaction requirements have been achieved, as specified above, prior to placement of subsequent lifts. In addition, compacted surfaces must be in a firm and unyielding condition.

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Controlled, compacted fill should consist of approved materials that are free of organic matter and debris or materials exceeding 4 inches in maximum dimension. Atlas personnel should be onsite to verify suitability of subgrade soil conditions, identify whether further work is necessary, and perform in-place moisture density testing.

Sufficient density tests should be performed to properly monitor compaction. At a minimum, Atlas recommends one test per lift as follows:

- Pavement and Exterior Flatwork Areas – 1 test every 10,000 square feet
- Utility Trench Backfill – 1 test every 100 linear feet

In cases where a large volume of fill (greater than 12 feet) is to be placed, the fill should be compacted to at least 100 percent as determined by ASTM D698 and within 2 percentage points of the material's optimum moisture content. *Note: Even if the fill is properly compacted, the fill is still subject to settlements over time of about 1 to 2 percent of the total fill thickness. This should be considered when designing structures and pavements on relatively deep backfill. Atlas should be contacted if alterative backfill recommendations are required to reduce settlement of mass fills.*

7.7 Excavations

Shallow excavations that do not exceed 4 feet in depth may be constructed with side slopes approaching vertical. Below this depth, it is recommended that slopes be constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations, Section 1926, Subpart P. Based on these regulations, on-site soils are classified as type “C” soil, and as such, excavations within these soils should be constructed at a maximum slope of 1½ feet horizontal to 1 foot vertical (1½:1) for excavations up to 20 feet in height. Excavations in excess of 20 feet will require additional analysis. *Note: These slope angles are considered stable for short-term conditions only and will not be stable for long-term conditions.*

During the subsurface exploration, the borehole sidewalls generally exhibited little indication of collapse; For deep excavations, native granular sediments cannot be expected to remain in position. These materials are prone to failure and may collapse, thereby undermining upper soil layers. This is especially true when excavations approach depths near the water table. Care must be taken to ensure that excavations are properly backfilled in accordance with procedures outlined in this report.

7.8 Groundwater Control

Groundwater was <u>not</u> encountered during the investigation and is anticipated to be below the depth of most construction. Special precautions may be required for control of surface runoff and subsurface seepage. It is recommended that runoff be directed away from open excavations. Silty soils may become soft and pump if subjected to excessive traffic during time of surface runoff. Ponded water in construction areas should be drained through methods such as trenching, sloping, crowning grades, nightly smooth drum rolling, or installing a French drain system. Additionally, temporary or permanent driveway sections should be constructed if extended wet weather is forecasted.

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8.0 GENERAL COMMENTS

Based on the subsurface conditions encountered during this investigation and available information regarding the proposed development, the site is adequate for the planned construction. When plans and specifications are complete, and if significant changes are made in the character or location of the proposed development, consultation with Atlas must be arranged as supplementary recommendations may be required. Suitability of subgrade soils and compaction of fill materials must be verified by Atlas personnel prior to placement of structural elements. Additionally, monitoring and testing should be performed to verify that suitable materials are used for fill and that proper placement and compaction techniques are utilized.

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APPENDIX I WARRANTY AND LIMITING CONDITIONS

Atlas warrants that findings and conclusions contained herein have been formulated in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology only for the site and project described in this report. These engineering methods have been developed to provide the client with information regarding apparent or potential engineering conditions relating to the site within the scope cited above and are necessarily limited to conditions observed at the time of the site visit and research. Field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for the purposes cited above.

Exclusive Use

This report was prepared for exclusive use of the property owner(s), at the time of the report, and their retained design consultants ("Client"). Conclusions and recommendations presented in this report are based on the agreed-upon scope of work outlined in this report together with the Contract for Professional Services between the Client and Atlas Technical Consultants ("Consultant"). Use or misuse of this report, or reliance upon findings hereof, by parties other than the Client is at their own risk. Neither Client nor Consultant make representation of warranty to such other parties as to accuracy or completeness of this report or suitability of its use by such other parties for purposes whatsoever, known or unknown, to Client nor Consultant. Neither Client nor Consultant shall have liability to indemnify or hold harmless third parties for losses incurred by actual or purported use or misuse of this report. No other warranties are implied or expressed.

Report Recommendations are Limited and Subject to Misinterpretation

There is a distinct possibility that conditions may exist that could not be identified within the scope of the investigation or that were not apparent during our site investigation. Findings of this report are limited to data collected from noted explorations advanced and do not account for unidentified fill zones, unsuitable soil types or conditions, and variability in soil moisture and groundwater conditions. To avoid possible misinterpretations of findings, conclusions, and implications of this report, Atlas should be retained to explain the report contents to other design professionals as well as construction professionals.

Since actual subsurface conditions on the site can only be verified by earthwork, note that construction recommendations are based on general assumptions from selective observations and selective field exploratory sampling. Upon commencement of construction, such conditions may be identified that require corrective actions, and these required corrective actions may impact the project budget. Therefore, construction recommendations in this report should be considered preliminary, and Atlas should be retained to observe actual subsurface conditions during earthwork construction activities to provide additional construction recommendations as needed.

Since geotechnical reports are subject to misinterpretation, **do not** separate the boring logs from the report. Rather, provide a copy of, or authorize for their use, the complete report to other

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design professionals or contractors. Locations of exploratory sites referenced within this report should be considered approximate locations only. For more accurate locations, services of a professional land surveyor are recommended.

This report is also limited to information available at the time it was prepared. In the event additional information is provided to Atlas following publication of our report, it will be forwarded to the client for evaluation in the form received.

Environmental Concerns

Comments in this report concerning either onsite conditions or observations, including soil appearances and odors, are provided as general information. These comments are not intended to describe, quantify, or evaluate environmental concerns or situations. Since personnel, skills, procedures, standards, and equipment differ, a geotechnical investigation report is not intended to substitute for a geo-environmental investigation or a Phase II/III Environmental Site Assessment. If environmental services are needed, Atlas can provide, via a separate contract, those personnel who are trained to investigate and delineate soil and water contamination.

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APPENDIX II SITE MAPS

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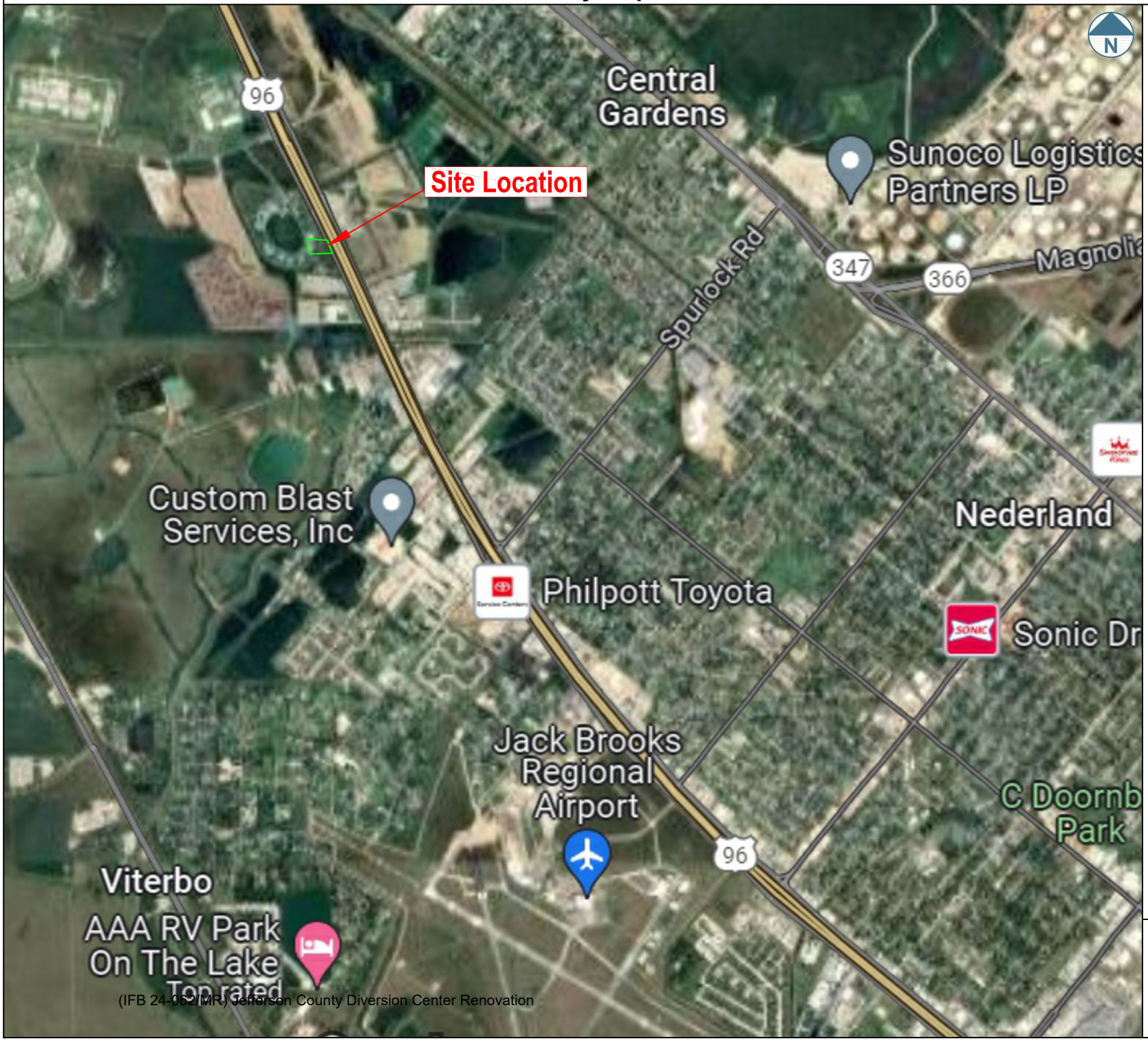
Vicinity Map

Figure 1



MAP NOTES:

- GoogleEarth Labels
- Not to Scale

LEGEND

Approximate Site Location

Diversion Center Driveway
3890 FM 3514
Beaumont, Texas

Modified from GoogleEarth
July 01, 2024
Drawing: 240296-1

ATLAS
150 North 13th Street
Beaumont, Texas 77702
Phone: (409) 299-9550
Web: oneatlas.com

Bore Location Plan

Figure 2

NOTES:

- Not to Scale

LEGEND

Approximate
Atlas Boring Location

Diversion Center Driveway
3890 FM 3514
Beaumont, Texas

Modified from GoogleEarth
July 01, 2024
Drawing: 240296-2

(IFB 24-062/MR) Jefferson County Diversion Center Renovation

ATLAS
150 North 13th Street
Beaumont, Texas 77702
Phone: (409) 299-9550
Web: oneatlas.com

APPENDIX III GEOTECHNICAL INVESTIGATION BORING LOGS

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BORING LOG

BORING NO.: **B-1**

GEOTECHNICAL CONSULTANT : Atlas Technical Consultants, LLC | SHEET 1 OF 1

PO NO. : 092304 | PHASE NO. : N/A | LATITUDE : 29.98800

PROJECT NAME : Diversion Center Driveway | LONGITUDE : -94.03478

LOCATION : 3890 FM 3514; Beaumont, Texas | DATE STARTED : 06-13-24

COUNTY : Jefferson | ATLAS PROJECT NO.: 240296 | DATE COMPLETED : 06-13-24

ELEVATION :	BORING METHOD : CFA	HAMMER : Auto
STATION :	RIG TYPE : Buggy	DRILLER/LOGGER : DAS/ATLAS
OFFSET :	CASING DIA. : N/A	TEMPERATURE : 91 °F
LINE :	CORE SIZE : N/A	WEATHER : Partly Cloudy
DEPTH : 10.0 ft		

GROUNDWATER: ▽ Encountered at Dry ▼ At completion Dry

ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	SAMPLE NUMBER	SPT per 6"	% PASSING No. 200 SIEVE	MOISTURE CONTENT	DRY DENSITY, pcf	POCKET PEN., tsf	UNCONF. COMP., tsf	ATTERBERG LIMITS LL	PL	PI	REMARKS
		LEAN CLAY (CL) Dark brown and brown with roots	ST		93	20.6		1.75	0.80	44	16	28	
	2.5	2.0 **FAT CLAY (CH)** Dark brown	ST			27.8		1.75					
		4.0 **FAT CLAY (CH)** Grayish brown											
	5.0		ST			33.9		1.75					
	7.5		ST			32.0		1.50		88	21	67	
			ST					1.25					
	10.0	10.0 Bottom of Boring at 10.0 ft											
	12.5												

ATLAS_INDOT BORING LOG_LAT LONG_240296 DIVERSION CENTER DRIVEWAY.GPJ INDOT TEMPLATE.GDT 7/1/24

BORING LOG

BORING NO.: **B-2**

GEOTECHNICAL CONSULTANT : Atlas Technical Consultants, LLC | SHEET 1 OF 1

PO NO. : 092304 | PHASE NO. : N/A | LATITUDE : 29.98799

PROJECT NAME : Diversion Center Driveway | LONGITUDE : -94.03418

LOCATION : 3890 FM 3514; Beaumont, Texas | DATE STARTED : 06-13-24

COUNTY : Jefferson | ATLAS PROJECT NO.: 240296 | DATE COMPLETED : 06-13-24

ELEVATION :	BORING METHOD : CFA	HAMMER : Auto
STATION :	RIG TYPE : Buggy	DRILLER/LOGGER : DAS/ATLAS
OFFSET :	CASING DIA. : N/A	TEMPERATURE : 91 °F
LINE :	CORE SIZE : N/A	WEATHER : Partly Cloudy
DEPTH : 10.0 ft		

GROUNDWATER: ▽ Encountered at Dry ▼ At completion Dry

ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	SAMPLE NUMBER	SPT per 6"	% PASSING No. 200 SIEVE	MOISTURE CONTENT	DRY DENSITY, pcf	POCKET PEN., tsf	UNCONF. COMP., tsf	ATTERBERG LIMITS LL	PL	PI	REMARKS
		FAT CLAY (CH) Dark brown and brown with roots	ST			27.9		2.00	1.00	52	13	39	
	2.5		ST			23.4		3.00					
	5.0		ST		95	23.9		1.50					
		6.0											
		FAT CLAY (CH) Grayish brown	ST			28.1		1.50		73	19	54	
	7.5		ST					2.00					
	10.0	10.0											
		Bottom of Boring at 10.0 ft											
	12.5												

ATLAS_INDOT BORING LOG_LAT LONG_240296 DIVERSION CENTER DRIVEWAY.GPJ INDOT TEMPLATE.GDT 7/1/24

BORING LOG

BORING NO.: **B-3**

GEOTECHNICAL CONSULTANT : Atlas Technical Consultants, LLC | SHEET 1 OF 1

PO NO. : 092304 | PHASE NO. : N/A | LATITUDE : 29.98799

PROJECT NAME : Diversion Center Driveway | LONGITUDE : -94.03389

LOCATION : 3890 FM 3514; Beaumont, Texas | DATE STARTED : 06-13-24

COUNTY : Jefferson | ATLAS PROJECT NO.: 240296 | DATE COMPLETED : 06-13-24

ELEVATION :	BORING METHOD : CFA	HAMMER : Auto
STATION :	RIG TYPE : Buggy	DRILLER/LOGGER : DAS/ATLAS
OFFSET :	CASING DIA. : N/A	TEMPERATURE : 91 °F
LINE :	CORE SIZE : N/A	WEATHER : Partly Cloudy
DEPTH : 10.0 ft		

GROUNDWATER: ▽ Encountered at Dry ▼ At completion Dry

ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	SAMPLE NUMBER	SPT per 6"	% PASSING No. 200 SIEVE	MOISTURE CONTENT	DRY DENSITY, pcf	POCKET PEN., tsf	UNCONF. COMP., tsf	ATTERBERG LIMITS LL	PL	PI	REMARKS
		FAT CLAY (CH) Dark brown and brown with roots	ST			27.2		2.75		71	23	48	
	2.0	**FAT CLAY (CH)** Brown and tan	ST			41.2		1.25	0.60				
	2.5	- becoming tan and gray below 4 feet	ST		95	30.0		1.00					
	5.0		ST					2.50					
	7.5		ST			31.4		2.75		88	21	67	
	10.0	Bottom of Boring at 10.0 ft											
	12.5												

ATLAS_INDOT BORING LOG_LAT LONG_240296 DIVERSION CENTER DRIVEWAY.GPJ INDOT TEMPLATE.GDT 7/1/24

APPENDIX IV GEOTECHNICAL GENERAL NOTES

Unified Soil Classification System			
Major Divisions		**Symbol**	**Soil Descriptions**
Coarse-Grained Soils < 50% passes No.200 sieve	Gravel & Gravelly Soils < 50% coarse	GW	Well-graded gravels; gravel/sand mixtures with little or no fines
		GP	Poorly-graded gravels; gravel/sand mixtures with little or no fines
		GM	Silty gravels; poorly-graded gravel/sand/silt mixtures
		GC	Clayey gravels; poorly-graded gravel/sand/clay mixtures
	Sand & Sandy Soils > 50% coarse fraction	SW	Well-graded sands; gravelly sands with little or no fines
		SP	Poorly-graded sands; gravelly sands with little or no fines
		SM	Silty sands; poorly-graded sand/gravel/silt mixtures
		SC	Clayey sands; poorly-graded sand/gravel/clay mixtures
Fine-Grained Soils > 50% passes No.200 sieve	Silts & Clays LL < 50	ML	Inorganic silts; sandy, gravelly or clayey silts
		CL	Lean clays; inorganic, gravelly, sandy, or silty, low to medium-plasticity clays
		OL	Organic, low-plasticity clays and silts
	Silts & Clays LL > 50	MH	Inorganic, elastic silts; sandy, gravelly or clayey elastic silts
		CH	Fat clays; high-plasticity, inorganic clays
		OH	Organic, medium to high-plasticity clays and silts
Highly Organic Soils		PT	Peat, humus, hydric soils with high organic content

Relative Density and Consistency Classification	
Coarse-Grained Soils	**SPT Blow Counts (N)**
Very Loose:	< 4
Loose:	4-10
Medium Dense:	10-30
Dense:	30-50
Very Dense:	> 50
Fine-Grained Soils	**SPT Blow Counts (N)**
Very Soft:	< 2
Soft:	2-4
Medium Stiff:	4-8
Stiff:	8-15
Very Stiff:	15-30
Hard:	> 30

Moisture Content and Cementation Classification	
Description	**Field Test**
Dry	Absence of moisture, dry to touch
Slightly Moist	Damp, but no visible moisture
Moist	Visible moisture
Wet	Visible free water
Saturated	Soil is usually below water table
Description	**Field Test**
Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

Particle Size	
Boulders:	> 12 in.
Cobbles:	12 to 3 in.
Gravel:	3 in. to 5 mm
Coarse-Grained Sand:	5 to 0.6 mm
Medium-Grained Sand:	0.6 to 0.2 mm
Fine-Grained Sand:	0.2 to 0.075 mm
Silts:	0.075 to 0.005 mm
Clays:	< 0.005 mm

Acronym List	
GS	grab sample
LL	Liquid Limit
M	moisture content
NP	non-plastic
PI	Plasticity Index
Q_p	penetrometer value, unconfined compressive strength, tsf
V	vane value, ultimate shearing strength, tsf

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SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.1 PROJECT

A. Project Name:

1. JC Diversion Center Renovation
   3890 FM 3514
   Beaumont, Texas 77705

B. Jefferson County, Texas

C. The Project consists of interior demolition and renovation of an approximately 18,426 square feet of floor space at abandoned juvenile detention center.

D. Work consists of, but is not limited to demolition, structural steel, concrete, metal framing, rough and finish carpentry, architectural casework, finishes, specialties, plumbing, electrical, HVAC, and fire suppression.

1.2 DESCRIPTION OF WORK

A. Scope of demolition and new work is shown on the Drawings.

1.3 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises as required by authorities having jurisdiction and the Owner.
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Material staging area to be designated by Owner.
   5. Parking locations for work personnel to be designated by Owner.
   6. Conduct deliveries, hauling, parking, and public street use with requirements of the City of Allen.

C. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

D. Do not obstruct roadways, sidewalks, or other public ways without permit.

E. Provide security and safety plans to the Owner and present them in a meeting to obtain sign off on procedures for the duration of the project.

F. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit. Construct protective structures for the protection of the public. Coordinate protective structures and other protective measures in cooperation with, and in compliance with, City of Fort Worth requirements.

D. Coordinate use of existing building spaces for storage with governing authorities. Do not exceed the existing structural systems capacity with stored items.

E. Utility Outages and Shutdown:
   1. Do not disrupt or shut down life safety systems serving separate properties, including but not limited to fire sprinklers and fire alarm system, without approval from separate property owners and authorities having jurisdiction.
   2. Prevent accidental disruption of utility services to separate properties.

1.4 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

B. Section 01 2000 - Price and Payment Procedures.

C. Section 01 3000 - Administrative Requirements.

D. Section 01 3250 – Construction Progress Schedule

E. Section 01 4000 - Quality Requirements.

F. Section 01 5000 - Temporary Facilities and Controls.

F. Section 01 6000 - Product Requirements.

G. Section 01 6116 – Volatile Organic Compound Content Restrictions

H. Section 01 7000 - Execution and Closeout Requirements.

I. Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Contracting Forms and Supplements: Forms to be used.

B. Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

C. General and Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

1.3 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

H. Submit three copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3000.
   3. Current construction photographs specified in Section 01 3000.
   4. Partial release of liens from major Subcontractors and vendors.
   5. Project record documents as specified in Section 01 7800, for review by Owner which will be returned to Contractor.
   6. Affidavits attesting to off-site stored products.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.

E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

G. Substantiation of Costs: Provide full information required for evaluation.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.6 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000 – Execution and Closeout Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. Refer to the AIA 201 General conditions for additional requirements concerning allowances,
   2. All lump-sum and Owner Controlled Allowances are within the Contract Sum, and shall be covered by the bonds, insurance, general conditions, overhead, profit and all other costs so that the totals represented by the Allowances are available without additional charge or cost to the Owner.

B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Owner Controlled Contingency allowances.

C. Related Sections:
   1. Division 01, File 01 22 00 - Unit Prices (for procedures for using unit prices)
   2. Divisions 02 through 49 (or as applicable) Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, Contractor shall advise Architect and Program Manager of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's or Program Manager’s request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Once the proposal is approved by the Owner, purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight, insurance, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a proposal based on the difference between purchase amount and the allowance.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. _____

B. _____

C. _____

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

1.2 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.3 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

E. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes,
calculate and certify quantities for payment purposes.

1.5 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Loading, hauling, and disposing of rejected Products.

1.6 SCHEDULE OF UNIT PRICES

Item 01: _____.

Item 02: _____.

Item 03: _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.2 RELATED REQUIREMENTS

A. Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.3 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.4 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – _____:
   1. Base Bid Item: _____.
   2. Alternate Item: _____.

B. Alternate No. 2 – _____:
   1. Base Bid Item: _____.
   2. Alternate Item: _____.

C. Alternate No. 3 – _____:
   1. Base Bid Item: _____.
   2. Alternate Item: _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:
   1. Division 01 Section "Allowances" for products selected under an allowance.
   2. Division 01 Section "Alternates" for products selected under an alternate.
   3. Division 01 Section "Substitution Procedures" for requirements for submitting comparable product submittals for products by listed manufacturers.
   4. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor and Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit one (1) copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include related Specification Section number and title, Drawing numbers and titles and complete documentation for substitution. Include the following information with each request:
   1. Certification by the Contractor to the effect that, in the Contractor’s opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal to or better than the work required by the Contract Documents, and that it will perform adequately in the application indicated.
      a. Include in a certification the Contractor’s waiver of right to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from IBC.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any.

3. Approval: If necessary, Architect will request additional information or documentation for evaluation within a reasonable amount time from receipt of a request for substitution. Architect will recommend to the Program Manager acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation. Program Manager will recommend to the Owner acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation. Upon recommendation from the Program Manager, the Owner will provide acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work with Program Manager and Owner written approval.
   b. Rejection will include a statement giving reason for rejection.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

B. The Owner may not consider the request if the Contractor cannot provide the product or method because of failure to pursue work promptly or coordinate activities properly.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Approval process for both types of substitutions shall be as described above.

B. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within twenty (20) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect, only when there is an advantage to the Owner. The Owner may override rejections made by the Architect and request that the Program Managers make a determination as to whether the substitution shall be considered by the Architect.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
      b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

D. System Substitution: No changes should be anticipated in major building system types or approved manufactures in pricing of schedule; the Owner has standardized materials in place in existing buildings and will not change for the convenience of the contractor.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Progress photographs.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Project record documents.

1.3 PROJECT COORDINATION

A. Project Coordinator: Person designated by the Owner, or the Owner's representative.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for facility access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in PDF format.
   4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
   5. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the contract sum.

C. Submittal Service: Use one of the following:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com.
   2. EADOC LLC (tel: 1-877-305-3844): www.eadocsoftware.com.
   3. Newforma Project Cloud: www.newformaprojectcloud.com.

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Major Subcontrators.
   5. Contractor's Superintendent.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.3 SITE MOBILIZATION MEETING

A. Owner will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.
   5. Major Subcontractors.

C. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements and occupancy prior to completion.
   3. Construction facilities and controls.
   4. Temporary utilities.
   5. Survey and building layout.
   6. Security and housekeeping procedures.
   7. Schedules.
   8. Application for payment procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Requirements for start-up of equipment.
   12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 PROGRESS MEETINGS

A. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.

4. Contractor's Superintendent.
5. Major Subcontractors.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.5 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.6 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
1. Completion of site clearing.
2. Excavations in progress.
3. Foundations in progress and upon completion.
4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Final completion, minimum of ten (10) photos.

E. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email with project record photo CD.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
   5. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.7 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.8 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.9 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

F. Schedule submittals to expedite the Project, and coordinate submission of related items.

G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

I. Provide space for Contractor and Architect review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3100

REQUESTS FOR INTERPRETATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Procedure for submittals requesting interpretation.

C. Number of copies of submittals.

1.02 RELATED SECTIONS

A. Section 01 3000 - Administrative Requirements: Additional administrative requirements.

B. Section 01 7800 - Closeout Submittals: Project record documents.

1.3 DEFINITIONS

A. Requests for Interpretation: A request from the contractor or one of its subcontractors, to the owner, seeking an interpretation or a clarification of some requirement of the contract documents. The contractor shall clearly and concisely set forth the issue for which it seeks clarification or interpretation and why a response is needed from the owner. The contractor shall, in the written request, set forth its interpretation or understanding of the contracts requirements along with reasons why it has reached such an understanding.

B. Drawing/Plan Clarification: An answer from the Architect, in response to an inquiry from the contractor, intended to make some requirement(s) of the drawings or plans clearly understood. Drawing/plan clarifications may be sketches, drawings, or in narrative form and will not change any requirements of the drawings or plans.

C. Project Communications: Routine written communications between the Architect and the contractor shall be in letter, field memo, email or fax format. Such communications shall not be identified as Requests for Information nor shall they substitute for any other written requirement pursuant to the provisions of these contract documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 REQUESTS FOR INTERPRETATION

A. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.
   a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
   b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Owner.
   a. Use AIA G716 - Request for Information .
3. Prepare using an electronic version of the form appended to this section.
4. Prepare using software provided by the Electronic Document Submittal Service.
5. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.
   5. Identify and include improper or frivolous RFIs.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.2 NUMBER OF COPIES OF SUBMITTALS

A. Provide one hard copy of all RFIs and support documentation to Architect with Close Out Documentation. Provide all parts to responses in consecutive order, with attachments clearly labeled with RFI numbers in 8 ½ x 11-inch format in 3-ring binder, clearly printed label on spine.

END OF SECTION

SECTION 01 3250

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

1.2 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

1.3 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

1.4 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after review of the preliminary schedule, submit complete schedule.

E. Submit updated schedule with each Application for Payment in electronic format..

1.5 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: 30 x 42 inches.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Provide sub-schedules for each stage of Work identified in Section 01 1000.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Include conferences and meetings in schedule.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month. This must be keyed exactly to schedule of values and Application for Payment forms. Owner will not make interpretations of items listed. Each must be matching for review purposes.

G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

H. Indicate delivery dates for owner-furnished products.

I. Provide legend for symbols and abbreviations used.

3.3 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method. Use of Microsoft Project for scheduling is acceptable.

B. Illustrate order and interdependence of activities and sequence of work. Indicate how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Monetary value of activity, keyed to Schedule of Values.
   12. Percentage of activity completed.
   13. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and re-computation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. In order of latest allowable start dates.
   4. Listing of activities on the critical path.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute electronic copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect and Owner.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 3553
SECURITY PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security measures including formal security program, entry control, personnel identification, guard service, miscellaneous restrictions, and other work necessary to secure the premises and Work of the project.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: use of premises and occupancy.

B. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting.

1.3 SECURITY PROGRAM

A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program at project mobilization.

C. Initiate program in coordination with Owner's existing security system at project mobilization.

D. Maintain program throughout construction period until Owner occupancy.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner on request.

D. Owner will control entrance of persons and vehicles related to Owner's operations.

E. Contractor shall control entrance of persons and vehicles related to Owner's operations.

F. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

1.5 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.

C. Maintain a list of accredited persons, submit copy to Owner on request.

D. Require return of badges at expiration of their employment on the Work.

1.6 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Control of installation.
F. Mock-ups.
G. Tolerances.
H. Manufacturers' field services.
I. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.
B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
    1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
    1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Testing Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Qualifications Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.5 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: construct integrated exterior mock-up as indicated on Drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

I. Accepted mock-ups shall be a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.

4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.6 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes, but is not limited to:
   1. Permits and fees.
   2. Code and regulatory compliance for the associated Work.
   3. Code and regulatory compliance for the design and construction of storm shelters.

1.2 DESIGN GUIDELINES

A. Quality Assurance
   1. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Texas.
      a. Comply with the Texas Professional Services Procurement Act when selecting an Engineer for Delegated Design Services.
   2. ICC 500-2008 Compliance: Each contractor responsible for the construction of a main wind-force resisting system or any component thereof, shall submit a written statement of responsibility to the authority having jurisdiction, the responsible design professional and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain:
      a. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
      b. Acknowledgement that control will be exercised to obtain compliance with the construction documents.
      c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of reports.
      d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.3 TECHNICAL GUIDELINES

A. Permits and Fees
   1. The Contractor will pay for all City and/or State Building Permits and other Building Fees related to the project. The Contractor and Subcontractors will be responsible for obtaining all required trade permits or license fees. Coordinate with Owner / Contractor contract.
   2. Building Codes (Verify most current with Authority Having Jurisdiction)
      a. Building Code Compliance Building Code – International Building Code
      b. Plumbing Code – International Plumbing Code
      c. Mechanical Code – International Mechanical Code
      d. Electrical Code – National Electrical Code
      e. Life Safety Code – NFPA 101, Current Edition.
   3. ICC/NSSA Standard for the Design and Construction of Storm Shelters:
      a. ICC 500-2008 American National Standard

4. Federal Emergency Management Agency (FEMA):
    a. FEMA 361 - Design and Construction Guidance for Community Shelters.
5. Energy Code Compliance
    a. Energy Code – International Energy Code
    b. Contractor shall provide, at the jobsite office, one copy of the completed energy code review.
    c. Contractor shall notify energy code plan review company, as selected by Architect, for all energy inspections.
6. Accessibility Compliance
    a. Accessibility requirements are from the 2010 ADA Standards for Accessible Design, and the 2012 Texas Accessibility Standards of the Architectural Barriers Act.
    b. The information contained in this section is provided to identify the modifications provided for users who are not served by adult standards. It shall be the Contractors responsibility to be familiar with the standards and to apply the standards to all aspects of the project. Any apparent conflict between current standards and the drawings shall be brought to the architect's attention for clarification. The information in the drawings does not release the contractor from full compliance with the latest TAS requirements.
    c. Contractor shall provide, at the jobsite office, one copy of the 2012 Texas Accessibility Standard (TAS) regulations as prepared by the Texas Department of Licensing and Regulation, concerning handicap accessibility. The Contractor shall conform to the regulations as set forth in the TAS. Copies can be obtained at Texas Department of Licensing and Regulation, P.O. Box 12157, Austin, TX; 512-539-5669 / Fax 512-539-5690; www.license.state.tx.us. Copies may be downloaded from http://www.license.state.tx.us/ab/abtas.htm.
    d. Federal Register:
    e. Vol. 56, No. 144, July 26, 1991, Rules and Regulations; Appendix A to part 36 – Standards for Accessible Design.
    f. 5 U.S.C. 552(a) and 1 C.F.R. part 51, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Building Elements Designed for Children's Use.
    g. Texas Accessibility Standards
    h. The Elimination of Architectural Barriers Texas Government Code, Chapter 469, effective March 15, 2012.

B. Accessibility Requirements
1. General
    a. All general TAS standards apply and staff-use areas and spaces for the use of students above the age of 12 shall be designed for adult users. In facilities for younger students, adult-use spaces will commonly be identified by their name (MEN, WOMEN, STAFF TLT, etc). Juvenile-use spaces will be likewise identified (BOYS, GIRLS, STU TLT, etc.).
    b. Besides the transition to adult dimensions for students above the age of 12, some requirements vary additionally, depending on age. Refer to the tables enclosed for the varying heights and spacing required.

2. Dimensional Tolerances
   a. Contractor is reminded that while the TAS guidelines allow for “construction and manufacturing tolerances” there is no “definition” of what that tolerance is, therefore, where TAS gives a single absolute dimension, every effort should be made to equal that dimension. Where TAS provides a dimensional range, or a minimum or a maximum, there is NO construction tolerance. Any dimension less than the minimum or more than the maximum will be rejected upon inspection and subject to correction.

PART 2 - PRODUCTS (Not Used)

2.1 GENERAL

A. Contractor shall note that no regulatory agency designates products with a formal “ADA Approved” designation. Contractor shall be responsible for ensuring all products are reviewed for accessibility compliance

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 4216

DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

E. Provide: To furnish and install.

F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTING SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements and qualifications including but not limited to:
   1. Professional testing and laboratory services.
   2. Accessories necessary for the completion of testing and laboratory services.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
   3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
   4. Specific test and inspection requirements are not specified in this Section.

C. A qualified independent testing laboratory and/or geotechnical engineering service selected and paid by Owner.
   1. The Owner will pay for the initial laboratory services of materials that comply with the requirements of the Contract Documents. The Contractor shall pay for testing and retesting of materials that do not comply with the requirements of the Contract Documents.

D. Inspecting agency shall perform inspections and tests in accordance with the rules and regulations of the building code, local authorities, Specifications of ASTM, and the Contract Documents.

E. Materials and workmanship found not in compliance with required standards or performance obligations shall be removed and replaced. Replacement and subsequent testing shall be at Contractor’s expense.

F. Where terms “Inspector” and “Laboratory” are used, it is meant and in reference to an officially designated and accredited inspector of the testing laboratory or geotechnical service engaged by Owner.

G. Laboratory inspections shall not relieve the Contractor or Fabricator of his responsibility to furnish materials and workmanship in accordance with the Contract Documents.

H. Contractor or Fabricator shall cooperate with the testing laboratory in matters pertaining to the Work.

I. Contractor to address deficiency and failed reports.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E 329 and ASTM E534; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
   3. Testing agencies shall be insured against errors and omissions by a professional liability insurance policy having a minimum limit of liability of $500,000.00.

B. Inspection and testing services the of testing agency shall be under the direction of a Registered Engineer licensed in the State of Oklahoma, charged with engineering managerial responsibility, and having a minimum of five (5) years engineering experience in inspection and testing of construction materials.

C. Concrete Inspectors: Inspecting personnel monitoring concrete Work shall be ACI certified inspectors.

D. Structural Steel: Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, *Standard and Guide for Qualification and Certification of Welding Inspectors*.
   1. Inspector may be supported by assistant inspectors who perform specific inspection functions under the direct supervision of the Primary Inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of assistant inspectors shall be monitored daily by the inspector.

E. Testing Equipment: Equipment shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.

F. Referenced Standards: Latest adopted edition of standards referenced apply to the Work. In the event of conflict between the Contract Documents and referenced standards, the Contract Documents shall govern. In case of conflict between Contract Documents and the Building Code, the more stringent shall govern.

1.4 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Refer to the individual specification sections for specific requirements.
   2. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
   3. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   4. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   5. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
   6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
   8. Associated Responsibilities and Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
      a. Provide access to the Work.
      b. Deliver of samples to testing laboratory, without cost to Owner, in adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
      c. Advise laboratory and Architect sufficiently in advance of construction operations to allow laboratory to complete required inspections or tests and to assign personnel for field inspection and testing as specified.
      d. Provide facilities for storage and curing of concrete test samples on site for the first 24 hours and for subsequent field curing required by ASTM C31.
      e. Incidental labor, facilities, and equipment necessary to assist laboratory personnel in obtaining and handling samples at the site.
      f. Preliminary design mix proposed for use for material mixes that require control by testing agency.
      g. Provide concrete mix designs in accordance with ACI 301 Section 3.9 made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, select and pay for laboratory.
      h. Obtain required inspections or approvals of the building official. Inspection requests and notifications required by building code are responsibility of the Contractor.
      i. Provide current welder certificates for each welder employed.
      j. Provide fabrication and erection inspection and testing of welds in accordance with AWS D1.1, Chapter 6.
         1) Use prequalification of welding procedures in executing the Work.
      k. Security and protection for samples and for testing and inspecting equipment at Project site.
   9. Retesting/Reinspecting: Regardless of payment responsibility of the original tests or inspections, provide quality control services, including retesting and reinspecting, for construction that replaced Work failing to comply with the Contract Documents or Code requirements.

C. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

D. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5 AUTHORITY AND DUTIES OF LABORATORY PERSONNEL

A. A representative of the testing laboratory, who has reviewed and is familiar with the project and specifications, shall participate in preconstruction conferences. The representative shall coordinate material testing and inspection requirements with the Contractor and its subcontractors consistent with the planned construction schedule. The laboratory representative shall attend conferences required or requested to address quality control issues.

B. Laboratory personnel shall inspect and test materials, assemblies, specimens, and Work performed, including design mixes, methods and techniques and report the progress to the Architect.

C. If material or Work fails to meet requirements of Contract Documents, laboratory inspector shall notify the Construction Manager, Architect, Engineers, supplier or subcontractor providing or preparing the materials or Work being tested of such failure.

D. Laboratory personnel shall not perform the Work of the Contractor or act as foremen or superintendents. Work will be inspected as it progresses, but failure to detect defective Work or materials shall not prevent later rejection when a defect is discovered.

E. Laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release the requirements of the Contract Documents or approve or accept portions of Work, except where approval is specifically specified in the Specifications.

F. Comply with building code requirements for Special Inspections.

1.6 SUBMITTALS

A. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.

5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

C. Test and Inspection Reports: Prepare and submit certified written reports specified. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Submit copies of reports of each inspection and test:
1. Owner, Program or Project Manager, Architect, and each Engineer or outside consultants regarding their particular phase of the project: One copy each.
2. Construction Manager and Contractor: Two copies each.

E. In addition to furnishing a written report, notify Construction Manager and Contractor verbally of uncorrected conditions or failures to comply with requirements of the Contract Documents, and immediately fax and email corresponding report to the Architect and Engineer.

F. At completion of each trade or branch of Work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of Work and full compliance with requirements of Contract Documents.

G. Submit copies of test results sealed by a Registered Engineer to municipal authorities having jurisdiction, as required.

1.7 TESTING LABORATORY GUIDELINES AND PROCEDURES

A. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap, i.e. earthwork, foundation inspections, rebar inspection, and concrete when scheduled concurrently at the site.

B. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for hours over eight hours spent at the site on a single day, field testing services performed on a Saturday or Sunday, and field services performed on a recognized holiday.

C. There shall be a three hour minimum for each scheduled testing service. Vehicle charges will be included on a $25.00 per trip basis.

D. Cylinder pick up will be controlled by the technician performing test on a scheduled pick up day. If there are no testing services scheduled, the cylinder pick up fee is $40.00 on week days and $50.00 on weekends and holidays with no technician or vehicle charge.

E. The Contractor shall bear the responsibility of scheduling the testing services. The Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations or failed test shall be reimbursable to the Owner by the responsible party for the cancellations or failure of a test or service.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.
5. Deficiency log.

B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 TESTING AND INSPECTION SERVICES

A. Testing services shall include, but not be limited to those specified below or which are necessary or required during course of construction to ascertain specification compliance and which may be deemed necessary by Architect, Engineer, or Owner to ensure the quality of the Work.

B. The Owner reserves the right to add to or delete any or all inspection and testing specified, excluding testing required by the applicable building codes.

C. If conflicts arise between Drawings and Specifications, notify Architect immediately. The most stringent requirements shall dictate procedure.

3.3 TESTING OF EARTHWORK

A. Testing Services (As specified or required):
1. References (As applicable for tests required):
a. American Society for Testing and Materials (ASTM)
1) D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)
2) D2922, Standard Test Method for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth)
3) D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
b. American Association of State Highway and Transportation Officials (AASHTO)
1) T89, Determining the Liquid Limit of Soils
2) T90, Determining the Plastic Limit and Plasticity Index of Soils

3) T99, Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305-mm (12-in) Drop
4) T238, Density of Soil and Soil Aggregates In Place By Nuclear Methods (Shallow Depth)

2. Perform sieve analysis to develop grain size distribution curves for materials to be used for subgrade, fill under slab on grade, and backfills.
3. Establish the moisture density relation of soils to be used as fill using the method best suited to the type of fill material.
4. Determine moisture content of all fill materials before placement and advise Contractor when it is or is not suitable to achieve required compaction.
5. Determine Liquid Limit in accordance with ASTM D4318 or AASHTO T89, Plastic Limit in accordance with ASTM D4318, and Plasticity Index in accordance with ASTM D4318 of all fill material,
6. Perform one in place density test for each 2,500 square feet (280 square yards) of existing subgrade material.
7. Perform Moisture-Density curve in accordance with ASTM D698 or AASHTO T99 for one type of fill material. If the original choice of material does not meet the specifications, the Contractor shall pay for additional testing.
8. Perform in place density tests of each lift of compacted fill at locations adequate to evaluate the degree of compaction of all fill areas. Conduct one test for each 2,500 square feet (280 square yards) of each lift of compacted fill.
9. Perform testing at a frequency of one in-place density and moisture test for each 75 lineal feet or less of utility trench, with a minimum of three tests per lift

B. Reports: Submit reports with the following information:
1. Type and condition of soil at footing bottoms.
2. Level of water table in the excavated areas.
3. Grain size distribution of fill materials (average of three tests).
4. Moisture density test results.
5. In place density test results with moisture content and relative density of each layer of compacted fill. Include with in place density test results, a plan showing location of each test.
6. Notify Architect by telephone within one hour of the discovery of the following conditions and follow up telephone notification with written report.
a. Materials used, or degree of soil compaction not meeting specified requirements.
b. Frost and freeze protection requirements for excavation bottoms not being complied with.
c. Water in excavations which is not being removed prior to Work being performed in excavation.

3.4 INSPECTION OF PIPED SITE UTILITIES

A. Laboratory representative shall observe and report on the following:
1. Proper alignment and grade of trenches.
2. Pipe bedding and supports.
3. Pipe, joints, jointing material, and thrust blocks prior to installation of pipe.
4. Installation of pipe and joints.
5. Testing of piped utilities performed by Contractor.

3.5 PAVING

A. Testing Services: Perform field tests for moisture density properties:
   1. Provide field testing of the subgrade as specified.
   2. Paving Subbase: Provide one field test for every 5,000 square feet of area of crushed limestone or caliche subbase.
   3. Lime Treated Subgrade: Provide one field test for every 5,000 square feet of area of lime treated subgrade for content of lime and subgrade compaction.
   4. Cement Soil Stabilization: Provide one field test for every 5,000 square feet of area of cement stabilized subgrade for content of cement and subgrade compaction.

3.6 PIER DRILLING OPERATION

A. A representative of a qualified geotechnical laboratory shall provide services specified.

B. Laboratory representative shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before placing concrete.

C. Laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.

D. Laboratory representative shall make continuous inspections of drilled pier construction to check the following:
   1. Verify soundness of bearing stratum and desired penetration.
   2. Verify pier dimensions and reinforcing used.
   3. Monitor condition of hole and removal of water and loose material from bottom.
   4. Monitor placement of concrete and use of tremie or pumps.
   5. Monitor the extraction of casing, if used.

E. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.7 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

A. Inspect concrete reinforcing steel prior to placing concrete for compliance with Contract Documents and approved shop drawings. Noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of the Contractor for correction and, if left uncorrected, reported to the Architect.

B. Laboratory representative shall observe and report on the following:
   1. Number and size of bars.
   2. Bending and lengths of bars.
   3. Splicing.
   4. Clearance to forms, including chair heights.
   5. Clearance to sides and bottom of trench if soil formed.
   6. Clearance between bars or spacing.
   7. Rust, form oil, and other contamination.
   8. Grade of steel.
   9. Securing, tying, and chairing of bars.
   10. Excessive congestion of reinforcing steel.
   11. Installation of anchor bolts and placement of concrete around such bolts.
   12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.

13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15 degrees off perpendicular and then bent back into position. Anchors failing this test shall be replaced.

C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

3.8 CONCRETE INSPECTION AND TESTING

A. Receive and evaluate proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as being unacceptable. Check the proposed mixes for proportions, water cement ratio and slump in accordance with ACI 613 and 318.

B. Comply with ACI 311 *Guide For Concrete Inspection* and ACI *Manual of Concrete Inspection* (SP-2).

C. Sample and test concrete placed at the site in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.

D. Test concrete:
1. Mold and cure five specimens from each sample.
   a. For each 50 cubic yards or fraction thereof of structural building concrete; and
   b. For each 100 cubic yards or fraction thereof of nonstructural concrete and site Work paving and sidewalks.
   c. Laboratory cure two cylinders in accordance with ASTM C192.
   d. Field cure remaining cylinders in accordance with ASTM C31.
2. Two specimens shall be tested at seven days for information, two shall be tested at 28 days for acceptance.
3. Store one cylinder for testing at 56 days in the event the 28 days strength tests do not meet strength requirements.

E. Deviations from the requirements of ASTM Specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.

F. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.

G. Supervise curing and protection provided for test specimens in field, and transportation from the field to laboratory. Test cylinders shall be stored in the field 24 hours and then carefully transported to laboratory and cured in accordance with ASTM C31.

H. Make one strength test (four cylinders) of each mix design of concrete placed in any one day.

I. Make one slump test for each set of cylinders following procedural requirements of ASTM C143 and ASTM C172. Make additional slump tests whenever consistency of concrete appears to vary. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

J. Determine total air content of air entrained normal weight concrete sample for each strength test in accordance with ASTM C231.

K. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.

L. Determine temperature of concrete sample for each strength test.

M. Inspect each batch of concrete, monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing form mixers before mix begins to set and within time limits set forth in ASTM C94.
   1. Monitor addition of water and high range water reducer to concrete at job site and length of time concrete is allowed to remain in truck during placement.

N. Testing agency shall furnish and maintain a competent inspector at the mixing plant at the start of each day's mixing. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content of each batch, general operation of the plant, and transportation of concrete to jobsite. Inspector shall verify that amount of free surface moisture contained in fine and course aggregate has been properly accounted for in the concrete mixing to achieve required consistency and water cement ratio.

O. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to the Architect, Contractor and concrete supplier. Do not permit addition of water which will exceed maximum water/cement ratio for the mix as given on the approved mix design.

P. Observe placing of concrete, except nonstructural slabs on grade and site Work. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when all procedures have been deemed satisfactory by the laboratory.

Q. Test reports shall include but no be limited to the following information: date of concrete placement, concrete mix identification number or proportion of ingredients, truck ticket number, time test was made, time of batching, location of each placement, slump, unit weight, water content (microwave test) and air content of concrete sampled and date and results of strength test.

R. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.

S. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or placed), amount of water added and time at which cement and aggregate were dispensed into the truck, and time at which concrete was discharged from the truck.

T. Evaluation and Acceptance:
   1. If measured slump, or air content of air entrained concrete, falls outside specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the specifications, and shall not be used in the structure.
   2. Strength level of concrete will be considered satisfactory if the averages of sets of three consecutive strength tests results are equal to, or exceed, specified strength and no individual test result (average of two cylinders) is below specified strength by more than 500 psi.

3. Completed concrete Work will be accepted when requirements of ACI 301 Chapter 18 *Specifications for Structural Concrete for Buildings* have been met.

U. Concrete Test Reports: Reports shall be made and distributed immediately after respective tests or inspections are made.
1. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and where applicable, a recommendation for corrective action.

V. Furnish a statistical analysis for each class of concrete placed on the project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by the Architect. Information shall include, but not be limited to, the following:
1. Strength tests at seven days.
2. Strength tests at 28 days of two cylinder averages.
3. 28 day moving average strength tests of last three test groups.
4. Standard deviation and coefficient of variation based on 28 day strength tests.
5. Average strength and number of 28 days tests for most recent month.
6. Strength test one cylinder at 56 days in the event the 28 days strength tests do not meet strength requirements.

W. Test Footings (Shafts) (Piers) (Caissons): Same diameter and type specified for footings, placed in same manner. Accepted test footings may be used in the Work.

X. Noncompliant Test Reports: Fax test reports indicating noncompliance immediately to each party on the test report distribution list. Copies shall be on different colored paper.

Y. Inspect application of curing compound and monitor curing conditions to assure compliance with specification requirements. Report curing deficiencies to the Contractor immediately and submit a written report to the Architect.

3.9 TESTING OF NONSHRINK GROUT

A. Make one strength test for all plates grouted and for all grout used in joints between members.

B. Each test shall consist of four cubes, two tested at 7 days and two at 28 days, made and tested in accordance with ASTM C109, with the exception that grout shall be restrained from expansion by a top plate.

3.10 STRUCTURAL STEEL

A. Inspect structural steel during and after erection for compliance with Contract Documents and shop drawings. Review and report on fabricator’s quality control procedures and capabilities.

B. Field Inspection:
1. Proper erection of pieces.
2. Proper touch up painting of shop primed structural steel exposed to view or in crawl space.
3. Proper installation of bolts.
4. Plumbness of structure and proper bracing.
5. Proper field painting.
6. Initial inspection of welding process and periodically thereafter as necessary.
7. Visual examination of completed welds.
8. Ultrasonic testing of penetration field welds.
9. Installation of field welded shear studs.

10. Inspect shop fabricated members, upon arrival at the site, for defects incurred during transit and handling.
11. Measure and record camber of beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Return members outside specified camber tolerance to shop for correction.

C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders employed on Work, along with certification that each welder has passed qualification tests within the past 12 months, using procedures covered in AWS D1.1 *Structural Welding Code - Steel*. Verify welder qualifications.

D. Inspection of field welding shall include:
1. Visually inspect fillet welds for size, soundness, and proper return around ends. Inspect seams, folds, and delaminations.
2. Visually inspect welds for proper repair of painting.
3. Ultrasonically test penetration welds in accordance with ASTM E164.
4. Inspect surfaces to be welded. Note surface preparations, fit up, and cleanliness of surface. Verify electrodes for size, type, and condition.
5. Welding inspector shall be present during alignment and fit up of members being welded, and shall verify for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and rewelded. Thoroughly inspect root passes for cracks. Gouge out cracks and rewelded to 2 inches beyond each end of crack.
6. Inspector shall verify that welds have been marked with welder's symbol and shall mark welds requiring repairs and reinspection. Inspector shall maintain a written record of welds. Work completed and inspected shall receive an identification mark by the inspector. Identify unacceptable material and Work identified by word *reject* or *repair* marked directly on the material.
7. Testing agency shall advise the Owner and Architect of any shop and/or field conditions which may require further tests and examination by means other than those specified. Additional tests and examinations shall be performed as authorized by the Owner and Architect.
8. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
9. Weld quality to comply with the American Institute of Steel Construction (AISC) Manual of Steel Construction.
10. Determine percentage of weld tested by the number of welds that fail the initial testing.
11. Reweld and retest welds that fail until the welds pass. Test two additional welds for every weld failure.

E. Inspect bolted construction in accordance with AISC *Specification for Structural Steel Buildings*:
1. Visually inspect bolts ensuring that plies have been brought into snug contact.
2. Inspect high strength bolt in accordance with Section 9 of the *Specifications for Structural Joints Using ASTM A325 or A490 Bolts*.

F. Inspect stud welding in accordance with Section 7.8, of AWS D1.1 *Structural Welding Code*:
1. Weld at least two shear studs at the start of each production period to determine correct generator, control unit, and stud welder setting. The studs shall be capable of being bent 45 degrees from vertical without weld failure.
2. When the temperature is below 32 degrees F (0 degrees C), test one stud in each 100 after cooling. Do not weld studs at temperatures below 0 degrees F or when surface is wet with rain or snow. If stud fails in the weld, two new studs shall pass the test before resumption of welding.

3. Visually inspect studs for compliance with the requirements of the Contract Documents. Verify number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud, that stud shall be struck with a hammer and bent 15 degrees off perpendicular in the direction away from the missing weld. Studs failing test shall be replaced.

3.11 REINFORCING STEEL MECHANICAL SPLICES

A. Inspection and Observation Services:
1. Visually inspect and report on completed condition of each mechanical splice of reinforcing steel.
2. Visually inspect each mechanical splice to ensure compliance with the ICC-ES Reports and the manufacturer's published criteria for acceptable completed splices.
3. Place special emphasis on the inspection of the end preparation of each bar to be spliced required by the ICC-ES Report.

B. Reports: Submit reports to Architect:
1. Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
2. Reports on each mechanical splice shall indicate location of the splice, size of bars spliced, and acceptability or rejection of splice. Indicate reasons for rejection on each report.

3.12 OPEN WEB JOISTS AND JOIST GIRDERS

A. Inspect joists at jobsite for compliance with specified fabrication requirements. Verify welded connections between web and chord, splices, and straightness of members.

B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for compliance with Contract Documents and referenced standards.

C. Verify welder qualification certificates for both shop and field welding operators.

3.13 METAL FLOOR DECK

A. Field inspection shall consist of:
1. Verifying types, gauges and finishes for compliance with Contract Documents and shop drawings.
2. Examine composite floor deck exposed to crawl space for damage to galvanizing due to welding or construction activities. Repair galvanized composite floor deck in accordance with the specifications.
3. Examine the erection of metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting or other coating.
4. Certification of welders.
5. Inspect and test field welded shear studs used to fasten metal floor decking to supporting steel as specified for structural steel.

3.14 METAL ROOF DECK

A. Field inspection shall consist of:
1. Verify types, gauges and finishes for compliance with Contract Documents and shop drawings.

2. Examine the erection of the metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
3. Certification of welders.
4. Visual inspection of at least 25 percent of welds.

3.15 SPRAYED FIREPROOFING

A. Verify applied thickness, density, and bond strength of sprayed fireproofing meets fire rating requirements of approved design.

B. Verify installation complies with fire rating requirements of approved design.

C. Inspect and test for thickness:
1. Test 25 percent of structural frame columns and beams in each building level.
2. Test 10 percent of beams other than structural frame in each building level.
3. Test one slab per 5,000 square feet of building area.

D. Inspect and test in accordance procedures of ASTM E605 and ASTM E736.

3.16 EXPANSION BOLT INSTALLATION

A. Inspect drilling of each hole and installation of each expansion bolt for compliance with Contract Documents and shop drawings.

B. Verify installation torque for each expansion bolt for compliance with manufacturer's installation instructions.

3.17 LIGHTWEIGHT INSULATING CONCRETE FILL

A. Inspection and Observation Services (As required):
1. Inspection of roof deck prior to start of Work.
2. Inspection during installation of insulation and lightweight insulating concrete fill Work to ascertain compliance with Contract Documents.
3. Observation of base ply fastener pull tests performed by Contractor to ascertain minimum withdrawal resistance of 40 pounds per fastener.

B. Testing Services (As required):
1. References (As applicable for tests required):
   a. American Society for Testing and Materials (ASTM)
      1) C177, Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded Hot Plate Apparatus
      2) C495, Test Method for Compressive Strength of Lightweight Insulating Concrete
      3) C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation
2. Test EPS insulation board for thermal insulation value in accordance with ASTM C177.
3. Test lightweight insulating concrete fill in accordance with ASTM C495 for:
   a. Mix design compressive strength.
   b. Mix design wet and dry density range.
   c. Number of Tests:
      1) One per 5,000 square feet
      2) Not less than one for each day's Work
4. Test EPS insulation board for density in accordance with ASTM C578.

3.18 TESTING OF ROOFING

A. Inspection and Observation Services (As required):
   1. Inspection of roof deck prior to start of Work.
   2. Inspect on site condition of stored roofing materials.
   3. Inspection during roofing, roof insulation, and sheet metal Work to ascertain compliance with Contract Documents.
   4. Observation of roof test cuts performed by Contractor to ascertain that they are properly made.
   5. Observation of patching of roof test cuts to ascertain that they are properly made.

B. Testing Services (As required):
   1. Perform dissection and analysis on cuts provided by Contractor to confirm number of plies, bonding of plies, weight of bitumen and softening temperature to ascertain compliance with specifications.

3.19 MASONRY

A. Inspection and Observation Services:
   1. Inspection of placement of reinforcement including condition, grade, size, location, spacing, and lap splices.
   2. Review mortar design mixes.
   3. Inspection of laying, mortaring, and grouting of concrete masonry units and elements.

B. Testing Services:
   1. References (As applicable for tests required):
      a. ASTM International (ASTM)
         1) C140, Standard Test Methods of Sampling and Testing Concrete Masonry Units
         2) C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
         3) C1019, Standard Test Method for Sampling and Testing Grout
         4) E447-97, Standard Test Methods for Compressive Strength of Laboratory Constructed Masonry Prisms
   2. Testing of Concrete Masonry Units (CMU):
      a. Preconstruction: Perform the following tests in accordance with ASTM C140.
         1) Compressive Strength
         2) Absorption
         3) Weight
         4) Moisture Content
         5) Dimensions
   3. Mortar Tests:
      a. Preconstruction: Perform the following tests in accordance with ASTM C780 on each type of mortar mix used on the Project.
      b. 28 Day Compressive Strength
      c. Water Retention
      d. Construction: Perform 28 day compressive strength test in accordance with ASTM C780 on each type of mortar mix used on the Project at the rate of one test per 2,000 square feet of masonry.
   4. Refer to and include Work for reinforcing steel specified.
   5. Grout Tests:

a. Preconstruction: Perform the following tests in accordance with ASTM C1019 on each type of grout mix used on the Project.
   1) Slump Test
   2) 28 Day Compressive Strength
   3) Construction: Perform 28 day compressive strength test in accordance with ASTM C1019 on each type of grout mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
   4) Prism Test: Perform preconstruction 28 day compressive strength test on concrete masonry walls in accordance with ASTM E447-97, Method B.

3.20 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 30.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION 01 45 20

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.4 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

C. Architect will pay for own telecommunications services.

1.5 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

C. At end of construction, return facilities to same or better condition as originally found.

1.6 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.7 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.8 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.9 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Provide one parking space for Owner use.

H. Provide one parking space for Architect use.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on Drawings.

B. Erect on site at location established by Architect.

1.13 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus 2021.

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity 2022.

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles 2015.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles 2015a.

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile 2021a.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples 2017 (Reapproved 2021).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit Current Edition.

H. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service 2015.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Texas Erosion and Sedimentation Control Manual.

C. Runoff Calculation Standard for Urban Areas: USDA TR-55.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:
   1. Submit within 2 weeks after Notice to Proceed.
   2. Include:
      a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.

b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
e. Other information required by law.
f. Format required by law is acceptable, provided any additional information specified is also included.

3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following:
1. Straw or hay.
2. Erosion control matting or netting.
3. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491/D4491M.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

D. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

E. Gravel: See Section 321123 for aggregate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet (7 m), minimum.
   2. Length: 50 feet (16 m), minimum.
   3. Provide at each construction entrance from public right-of-way.
   4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   2. Space sediment barriers with the following maximum slope length upslope from barrier:
      a. Slope of Less Than 2 Percent: 100 feet (30 m)..
      b. Slope Between 2 and 5 Percent: 75 feet (23 m).
      c. Slope Between 5 and 10 Percent: 50 feet (15 m).
      d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
      e. Slope Over 20 Percent: 15 feet (4.5 m).

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches (150 mm).
   2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
   3. Place and compact at least 6 inches (150 mm) of 1 1/2 to 3 1/2 inch (40 to 90 mm) diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
   7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

C. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
   3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
   4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
   5. Incorporate fertilizer into soil before seeding.
   6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
   7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
   8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates unless need for fence has passed.
   2. Remove silt deposits that exceed one-third of the height of the fence.
   3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 015719

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality after completion of construction.

D. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment
      from construction dust.
   3. Establish condition of existing ducts and equipment prior to start of alterations.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Testing and inspection services.

B. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 230801 - Testing and Balancing of HVAC Systems

1.04 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.

B. ASHRAE Std 62.1 - Ventilation For Acceptable Indoor Air Quality; 2013.

C. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).

D. ASTM D5149 - Standard Test Method for Ozone in the Atmosphere: Continuous Measurement by Ethylene Chemiluminescence; 2002 (Reapproved 2008).

E. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology); 2009.

F. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.1, 2010.

G. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air; April 1990.

H. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; Jan-99.

I. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.
   4. Identify areas of project potentially affected, especially occupied areas.
   5. Evaluate potential problems by severity and describe methods of control.
   6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
   7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
   1. Testing agency qualifications.
   2. Locations and scheduling of airsampling.
   3. Test procedures, in detail.
   4. Test instruments and apparatus.
   5. Sampling methods.

F. Air Contaminant Test Reports: Show:
   1. Location where each sample was taken, and time.
   2. Test values for each air sample; average the values of each set of 3.
   3. HVAC operating conditions.
   4. Certification of test equipment calibration.
   5. Other conditions or discrepancies that might have influenced results.

G. Ventilation Effectiveness Test Plan: Identify:
   1. Testing agency qualifications.
   2. Description of test spaces, including locations of air sampling.
   3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
   4. Test instruments and apparatus; identify tracer gas to be used.
   5. Sampling methods.

H. Ventilation Effectiveness Test Reports: Show:
   A. Include preliminary tests of instruments and apparatus and of test spaces.
   B. Calculation of ventilation effectiveness, E.
   C. Location where each sample was taken, and time.
   D. Test values for each air sample.
   S. HVAC operating conditions.
   T. Other information specified in ASHRAE Std 129.
   U. Other conditions or discrepancies that might have influenced results.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See Section 016116.

B. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

C. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

E. HVAC equipment and supply air ductwork may be used for ventilation during construction:
   1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
   2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
   3. Do not use return air ductwork for ventilation unless absolutely necessary.
   4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

F. Do not store construction materials or waste in mechanical or electrical rooms.

G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:
   1. All construction is complete.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
   4. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
   1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
   2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
   3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
   4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
      a. Begin ventilation at least three hours prior to daily occupancy.
      b. Continue ventilation during all occupied periods.
      c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:
   1. All construction is complete, including interior finishes.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:
   1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
   2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
   3. Collect samples from height from 36 inches to 72 inches above floor.
   4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
   5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
   6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Limits:

I. Formaldehyde: Not more than 27 parts per billion.

J. PM10 Particulates: Not more than 50 micrograms per cubic meter.

K. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.

L. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.

M. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

N. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
2. Particulates: EPA 600/4-90/010 Method IP-10.
3. Ozone: ASTM D5149.
4. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
5. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
6. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

O. Air Contaminant Concentration Determination and Limits:
1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.
3. Formaldehyde: Not more than 50 parts per billion.
4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.
5. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.
6. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to
outside air; not more than 200 micrograms per cubic meter higher than outside air.
7. Particulates (PM10): Not more than 50 micrograms per cubic meter.
8. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.

P. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

3.04 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.

B. Do not begin ventilation effectiveness testing until:
1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
2. Building flush-out or air contaminant testing has been completed satisfactorily.
3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE Std 129.

D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Instructions to Bidders: Product options and substitution procedures prior to bid date.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.3 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content.

B. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

C. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action.

D. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action.

E. HPDC (Tool) - Create an HPD On-Line Tool; Health Product Declaration Collaborative.

F. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures.

G. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework.

H. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines.

I. ISO 21930 - Sustainability in building construction -- Environmental declaration of building products.

J. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.

K. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.4 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.5 QUALITY ASSURANCE

A. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
   1. Good: Product-specific; compliant with ISO 14044.
   2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.

B. GreenScreen Chemical Hazard Analysis: All ingredients of 100 parts-per-million or greater evaluated using GreenScreen for Safer Chemicals Method v1.2.
   1. Good: GreenScreen List Translator evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
   2. Better: GreenScreen Full Assessment.
   3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
   4. Acceptable Evidence: GreenScreen report.

C. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "Create an HPD" on-line tool; HPD's with "unknown" listed for any hazard will not be considered acceptable.

D. Recycled Content: Determine percentage of post-consumer and post-industrial (pre-consumer) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
   4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.

5. Acceptable Evidence:
   a. For percentage of recycled content, information from manufacturer.
   b. For cost, Contractor's cost data.

E. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
   1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
   2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

F. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
   1. In all cases, indicate the location of final assembly.
   2. For harvested products, indicate location of harvest.
   3. For extracted (i.e. mined) products, indicate location of extraction.
   4. For recovered products, indicate location of recovery.
   5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
   6. Acceptable Evidence:
      a. Manufacturer's certification.
      b. Life cycle analysis (LCA) performed by third-party.

G. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
   1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit http://www.fsccanada.org, for the USA visit http://www.fscus.org.
   2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See Section 01 1000 for list of items required to be salvaged for reuse and relocation.

2.2 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC’s or HCFC’s.
   2. Containing lead, cadmium, or asbestos.

C. Motors: Refer to Division 21: Common Motor Requirements for Fire Suppression Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

D. Motors: Refer to Division 22: Common Motor Requirements for Plumbing Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

E. Motors: Refer to Division 23: Common Motor Requirements for HVAC Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

F. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

G. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

C. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.

D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

E. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

G. Substitution Submittal Procedure (after contract award):
1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.2 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

PRODUCT SUBSTITUTION REQUEST FORM

(During the Bidding Phase – Must be submitted a minimum of 10 days before the bid date)

Project: _____ Substitution Request No: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project No: _____

Reference: _____ Contract For: _____

Specification Title: _____

Section: _____ Page: _____ Article / Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____

Telephone: _____ Proposed Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its installation.

The undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by substitution.

Submitted By: _____ Signed :_____

Firm: _____ Address: _____

Phone: _____ _____

A/E's REVIEW & ACTION

☐ Substitution approved – Make submittals in accordance with Project Manual requirements.
☐ Substitution approved as noted – Make submittals in accordance with Project Manual requirements.
☐ Substitution rejected – Use specified materials.
☐ Substitution Request received too late – Use specified materials.

A/E Signature: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

JEST FORM

PRODUCT SUBSTITUTION REQUEST FORM
(After the Bidding Phase)

Project: _____ Substitution Request No: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project No: _____

Reference: _____ Contract For: _____

Specification Title: _____

Section: _____ Page: _____ Article / Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____

Telephone: _____ Proposed Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; Explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____)

Proposed substitution changes Contract Time: ☐ No ☐ Yes (Add) (Deduct) _____ days

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

The undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted By: _____ Signed : _____

Firm: _____ Address: _____

Phone: _____

Attachments: _____

A/E's REVIEW & ACTION

☐ Substitution approved – Make submittals in accordance with Project Manual requirements.
☐ Substitution approved as noted – Make submittals in accordance with Project Manual requirements.
☐ Substitution rejected – Use specified materials.
☐ Substitution Request received too late – Use specified materials.

A/E Signature: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

END OF REQUEST FORM

SECTION 01 6116

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.

C. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

D. Section 07 9200 - Joint Sealants: Emissions-compliant sealants.

1.3 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings.
   2. Interior adhesives and sealants, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.
   6. Thermal and acoustical insulation.
   7. Free-standing furniture.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings.
   2. Interior adhesives and sealants, including flooring adhesives.
   3. Wet-applied roofing and waterproofing.
   4. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association; 2012.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.1, 2010.

E. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.

F. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

G. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

H. CRI (GLP) - Green Label Plus Testing Program - Certified Products; www.carpet-rug.org; current edition.

I. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.

J. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.

K. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

L. SCS (CPD) - SCS Certified Products; current listings at www.scscertified.com.

M. UL (GGG) - GREENGUARD Gold Certified Products; current listings at http://http://productguide.ulenvironment.com/QuickSearch.aspx.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

C. Sustainable Design Reporting: Submit evidence of compliance along with Material Content Form.

D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.6 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
      b. Report of laboratory testing performed in accordance with requirements.
      c. Published product data showing compliance with requirements.
      d. Certification by manufacturer that product complies with requirements.

D. Furnishings Emissions Standard and Test Method: BIFMA e3 Sections 7.6.1 and 7.6.2, tested in accordance with BIFMA M7.1.
   1. Evidence of Compliance:
      a. Test report showing compliance and stating exposure scenario used.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
   2. Furnishings: Comply with Furnishings Emissions Standard and Test Method.
   3. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.
   3. Joint Sealants: SCAQMD 1168 Rule.
   4. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   5. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

H. General requirements for maintenance service.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.3 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.4 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.5 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that established by Owner provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.9 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7123
FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Construction surveying by Contractor.

C. Support and bracing.

1.2 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

D. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
   1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

E. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.
   1. Major equipment and materials installed as part of the work.
   2. Location of areas in which construction was performed.
   3. Work performed, including field quality control measures and testing.
   4. Weather conditions.
   5. Delays encountered, amount of delay incurred, and the reasons for the delay.
   6. Instructions received from Architect or Owner, if any.

F. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.3 REFERENCE STANDARDS

A. State Plane Coordinate System for the State in which the Project is located.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit in addition to items required in Section 017000 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:
   1. Field Engineering: Submit daily reports, with content as indicated in this section.

1.6 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 01 7000 - Execution and Closeout Requirements.

B. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on drawings in relation to property survey and existing benchmarks.

B. Notify Owner’s representative and Architect of discrepancies immediately in writing before proceeding to lay out work.

C. Locate and protect existing benchmarks, base lines, and demarcations. Preserve permanent reference points during construction.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.2 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and Owner of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and Owner in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

3.3 CONSTRUCTION SURVEYING

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
   1. Alignment Staking: Provide alignment stakes at 50 foot (15.24 m) intervals on tangent, and at 25 foot (7.62 m) intervals on curves.
   2. Structure: Stake out structures, including elevations, and check prior to and during construction.
   3. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.

B. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

C. Accuracy:
   1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
      a. Accuracy of Other Staking: Plus/minus 0.04 foot (12.2 mm) horizontally and plus/minus 0.02 foot (6.1 mm) vertically.
      b. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
   2. Owner reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.4 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

3.5 REPORTS

A. Submit two copies of Contractor's daily reports at Architect's field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.6 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
   1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
   2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to Owner. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 311000 - Site Clearing for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

H. The following sources may be useful in developing the Waste Management Plan:

I. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 01 3100 Project Management and Coordination: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 01 3000 – Administrative Requirements, for submittal procedures.

B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
   1. Submit to Architect for Owner's review and approval.
   2. If Owner wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.

3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
4. Describe as many alternatives to landfilling as possible:
   a. List each material proposed to be salvaged, reused, or recycled.
   b. List the proposed local market for each material.
   c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
5. Provide alternatives to landfilling for at least the following materials:
   a. Concrete.
   b. Bricks.
   c. Concrete masonry units.
   d. Asphalt paving.
   e. Glass.
   f. Plastic buckets.
   g. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   h. Windows, doors, and door hardware.
   i. Fluorescent lamps (light bulbs).

C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.

D. Waste Management Plan: Include the following information:
1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.

E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 01 2500 – Substitution Procedures for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 2500:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3100 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. As a minimum, provide:
      a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
      b. Separate dumpsters for each category of recyclable.
      c. Recycling bins at worker lunch area.
   2. Provide containers as required.
   3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   5. Locate enclosures out of the way of construction traffic.
   6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
   8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7610

TEMPORARY PROTECTIVE COVERINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary protective coverings for installed floors, walls, and other surfaces.

1.2 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Coordination of requirements for materials specified in this section.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes available; and installation instructions.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide materials that are easily removed without damage to the surfaces covered and with the following characteristics:
   1. Water resistant.
   2. Vapor permeable.
   3. Impact resistant.
   4. Slip resistant.
   5. Flame retardant.

2.2 MATERIALS

A. Sheet Materials:
   1. Corrugated polypropylene sheet.
   2. Plywood, 1/2 inch (13 mm) thick nominal.
   3. Flame Retardance: Meet requirements of NFPA 701.
   4. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

B. Rolled Materials:
   1. Self-adhering polyethylene film.
   2. Recycled cellulose fiberboard paper.

C. Corner and Door Jamb Protection Materials:
   1. PVC plastic.

D. Tape: Type recommended by protective covering material manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove dirt and debris from surfaces to be protected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Trim or overlap sheet materials to fit area to be covered.

C. Roll out and cut rolled materials to fit area to be covered.

D. Tape seams. Avoid taping directly to finished surfaces.

E. Stretch self-adhering film materials to completely cover surface.

F. Install door jamb protection to full height of opening.

3.3 REMOVAL

A. Remove protective coverings prior to Date of Substantial Completion. Reuse or recycle materials if possible.

END OF SECTION

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Include test and balancing reports.

N. Additional Requirements: As specified in individual product specification sections.

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

3.6 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Landscape irrigation.
   6. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two

attendees per training session.

1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   3. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   4. The location of the O&M manuals and procedures for use and preservation; backup copies.
   5. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   6. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   7. Review the applicable O&M manuals.
   8. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   9. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   10. Provide hands-on training on all operational modes possible and preventive maintenance.
   11. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   12. Discuss common troubleshooting problems and solutions.
   13. Discuss any peculiarities of equipment installation or operation.
   14. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   15. Review recommended tools and spare parts inventory suggestions of manufacturers.
   16. Review spare parts and tools required to be furnished by Contractor.
   17. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 9113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner’s operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Functional Completion.

C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. The Commissioning Authority is employed by Owner.

1.2 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Building envelope:
   1. Air tightness.

C. Plumbing Systems:
   1. Water heaters.
   2. Landscape irrigation.

D. HVAC System, including:
   1. Major and minor equipmentitems.
   2. Piping systems and equipment.
   3. Ductwork and accessories.
   4. Terminal units.
   5. Control system.
   6. Sound control devices.
   7. Vibration control devices.
   8. Variable frequency drives.

E. Special Ventilation:
   1. Hoods.
   2. Specialty fans.

F. Electrical Systems:
   1. Power quality.
   2. Emergency power systems.
   3. Lighting controls other than manual switches.

G. Electronic Safety and Security:
   1. Fire and smoke alarms.

H. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 RELATED REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Precautions and procedures; smoking room testing; building flush-out.

B. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

C. Section 01 7900 - Demonstration and Training: Scope and procedures for Owner personnel training.

1.4 REFERENCE STANDARDS

A. ANSI/RESNET/ICC 301 - Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index; 2014.

B. ANSI/RESNET/ICC 380 - Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems; 2016.

C. ASHRAE Std 202 - Commissioning Process for Buildings and Systems; 2013 (2017a).

D. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010.

E. ASTM E1827 - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door; 2011 (Reapproved 2017).

F. CSI/CSC MF - Masterformat; 2014.

G. NEBB S110 - Whole Building Technical Commissioning Of New Construction; 2018.

H. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; current edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

C. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

D. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

E. Startup Plans and Reports.

F. Completed Prefunctional Checklists.

G. Commissioning Issues Log:
   1. Construction observations.
   2. Supporting photographs.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Provide all standard testing equipment required to perform building envelope air tightness testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

C. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
   3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

E. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority has prepared the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after start of work.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 DOCUMENTATION IDENTIFICATION SYSTEM

A. Give each submitted form or report a unique identification; use the following scheme.

B. Type of Document: Use the following prefixes:
   1. Startup Plan: SP-.
   2. Startup Report: SR-.
   3. Prefunctional Checklist: PC-.
   4. Functional Test Procedure: FTP-.
   5. Functional Test Report: FTR-.

C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
   1. 2300: HVAC system as a whole.
   2. 2320: HVAC Piping and Pumps.
   3. 2330: HVAC Air Distribution.

D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.

E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.

F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.3 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.4 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.

7. Submit completed Checklists to Commissioning Authority within two days of completion.
8. See Section 01 7000 - Execution and Closeout Requirements for additional general startup requirements.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.5 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.

5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
   1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
   2. Examples of Functional Testing:
      a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
      d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

G. Factory Tests: Commissioning Authority and Contractor are responsible for coordinating testing of equipment at the factory by factory personnel, to ensure compliance with commissioning requirements.

H. Field Tests By Others: Where Functional Tests are indicated as to be performed by others not subject to Contract Documents, those tests are not subject to these commissioning requirements.

3.6 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.

3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
9. Oxygen and CO2 Monitors: 0.1 percentage points.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.

4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.7 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. 25% = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. 5% = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least 25% percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If 5% percent of the units in the first sample fail, test another 50% percent of the remaining identical units.
7. If 5% percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.8 BUILDING ENVELOPE COMMISSIONING

A. General: Comply with the following procedural requirements:
   1. NEBB S110 Whole Building Technical Commissioning of New Construction.
   2. ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
   3. ASTM E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.
   4. ANSI/RESNET/ICC 301 Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index.

B. Verify that the building envelope has been sufficiently completed for testing to commence.

C. Conduct ongoing inspections as construction progresses to document satisfactory installation conditions. related to thermal and moisture integrity of the building envelope that become concealed upon completion of construction.

D. Submit a detailed narrative of proposed pressure test procedures prior to the test. Include a plan view showing proposed installation locations (personnel doors or other similar openings) for blower doors (or flexible ducts for trailer-mounted fans, if used).

E. Avoid testing on days forecast to experience high winds, rain, or snow.

F. Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed the specified requirements.
   1. Use equipment and methods necessary to produce indoor/outdoor pressure differential of 0.2 inches w.g..
   2. Use RESNET accredited software to document salient features of project's building envelope and to calculate the HERS Index Score.

G. Determine location and nature of undesirable air leakage pathways using methods specified in ASTM E1186-17 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

H. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
   1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.
   2. Insulation for remedying building envelope deficiencies evidenced as excessive air leakage is specified in Section 072100.
   3. Air barriers for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 07 2500.
   4. Sealants for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 07 9200.

3.9 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of building elements for alterations purposes.

B. Abandonment and removal of existing utilities and utility structures.

1.2 REFERENCES

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.4 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 SCOPE

A. Demolition documents are diagrammatic and intended to delineate the general design scope of the extents of demolition, they are not intended to illustrate all items scheduled for demolition.

B. The General Contractor shall be responsible to coordinate the extents of demolition with the Construction Documents in order to achieve the desired design intent.

C. The scope of this project does not include asbestos removal. If suspicious materials are uncovered, the Contractor shall cease work and contact the Landlord, Owner, Architect and Authorities having jurisdiction.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.

3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
4. Provide, erect, and maintain temporary barriers and security devices.
5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
6. Do not close or obstruct roadways or sidewalks without permit.
7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 41 17
DEMOLITION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies the requirements for demolition of facilities and structures.

B. Extent of demolition work is shown on Drawings. Demolition may, but not necessarily, require removal and disposal, off the Work Site, of the following:

1. Building structures, as indicated on Drawings, except items to be removed by WISD prior to start of work.

2. Entrances, drives, parking lots and structures, and adjacent landscape work to limits indicated on Drawings.

3. Building foundations and supporting walls to a uniform depth of 12 inches below lowest foundation elevation.

4. Paving, curbs, gutters, walkways, and related concrete and asphalt.

1.02 SUBMITTALS

A. In accordance with Section 01340 - Shop Drawings, Product Data, Samples, and Record Documents of these Specifications, the following shall be submitted:

1. Proposed methods and operations of building demo to WISD for review and approval prior to start of Work. Include required coordination by agencies for shut-off, capping, and continuation of utility services as required. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of WISD operations.

1.03 QUALITY ASSURANCE/JOB CONDITIONS

A. Reference Standards Applicable to this Section

1. ANSI: American National Standards Institute

   a. A10.6 Safety Requirements for Demolition Operations

2. NFPA: National Fire Protection Association.

   a. 30: Flammable and combustible Liquids Code

b. 241: Standard for Safeguarding Building Construction and Demolition Operations.

B. Regulations

Comply with applicable OSHA and EPA regulations and codes and local ordinances.

C. Occupancy

Structures to be demolished will be discontinued in use prior to start of Work.

D. Condition of Structures and Work Site

WISD assumes no responsibility for actual condition of structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by WISD insofar as practicable. However, variations within structure and Work Site may occur prior to start of demolition work.

E. Partial Removal

Items of value to Contractor may be removed, as directed, as Work progresses. Salvaged items shall become the property of the Contractor and shall be transported from Site as they are removed. Storage or sale of removed items on-Site will not be permitted.

F. Explosives

Use of explosives will not be permitted.

G. Traffic

Contractor shall comply with Section 01570 - Traffic Regulation of these Specifications. Conduct demolition operations and removal of debris to ensure minimum interference with WISD operations, roads, streets, walks, and adjacent facilities. Do not close or obstruct streets, walks or other facilities without written permission from authorities having jurisdiction. Provide and identify alternate routes around closed or obstructed traffic ways as required by governing regulations.

H. Protection

Contractor shall comply with Section 01510 - Temporary Facilities of these Specifications. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to persons and adjacent buildings, structures, and facilities. Erect temporary covered passageways as required by authorities having jurisdiction. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

I. Damages

Promptly repair damages caused by demolition operations at no cost to WISD or adjacent property owners.

J. Utility Services

Contractor shall comply with Section 01541 - Maintenance and Protection of Utilities of these Specifications. Maintain existing utilities indicated to remain, keep in like service, and protect against damage during demolition operations. Do not interrupt existing utilities serving facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary service during interruptions to existing utilities, as acceptable to governing authorities. Contractor shall disconnect and seal utilities serving structures to be demolished, prior to start of demolition work, upon written direction of WISD and utility owner.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 DEMOLITION

A. General

Contractor shall comply with NFPA 241 and ANSI A 10.6 prior to and during commencement of demolition.

B. Pollution Control

Contractor shall comply with Section 01560 - Environmental Impact Controls of these Specifications. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. comply with governing EPA, OSHA, and local regulations pertaining to environmental protection. Do not create hazardous or objectionable conditions such as flooding and water pollution. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by governing authorities. Return adjacent areas to condition existing prior to start of Work.

C. Building Demolition

Demolish building and structures completely and remove from Work Site. Use such methods as required to complete Work within limitations of governing regulations.

1. Proceed with demolition in systematic manner, from top of structure to ground.

2. Demolish concrete and masonry in small sections.

3. Break up and remove concrete and asphalt slabs-on-grade, unless otherwise shown to remain.

D. Below-Grade Construction

Demolish foundation walls to a depth of not less than 12 inches below subgrade or lowest foundation element. Demolish and remove below-grade wood, metal construction, floor construction, and concrete and asphalt slabs.

E. Filling Voids

1. Completely fill below-grade areas and voids resulting from demolition. Coordinate with work of Sections 311100 – Clearing and Grubbing, and 310000 – Earthwork of these Specifications.

2. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots and other organic matter.

3. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris.

4. Place fill materials in horizontal layers not exceeding 8 inches in loose depth. compact each layer at optimum moisture content of fill material to a density as specified in Section 310000 - Earthwork of these Specifications.

5. After fill placement and compaction as specified, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. General

Remove from Work Site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials from demolished structures will not be permitted on Site.

B. Removal

Safely transport demolished materials and dispose of legally off Site. Contractor shall comply with NFPA 241, ANSI A 10.6, and NFPA 30, as applicable to the Work of disposal and transport.

END OF SECTION 02 41 17

SECTION 03 05 80

UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 - GENERAL

1.1 SUMMARY

A. Products Supplied Under This Section
   1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. RELATED SECTIONS
   1. Section 03 30 00 Cast-in-place Structural Concrete
   2. Section 01 45 23 Structural Testing and Inspection

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154-88 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)
   1. ACI 302.2R-06 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.

1.3 SUBMITTALS

A. Quality Control / Assurance
   1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s samples, literature
   3. Manufacturer’s installation instructions for placement, seaming and pipe boot installation.

1.4 SUBSTITUTIONS

A. Product Review
   1. Request must be made 14 days prior to bid date to allow time for proper review. Reviews will be at contractor’s expense.
   2. Independent laboratory test results showing compliance with ASTM E 1745 Class A, a permeance less than 0.01 Perms (grains/(ft2 *hr * in. Hg) before and after the mandatory conditioning tests ASTM E 154 Sections 8,11,12, and 13. (Woven, and recycled plastics are not permitted
   3. Incomplete substitutions will not be accepted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Barrier (Performance based specification). When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision. Vapor Barrier membrane must have the following properties.
   1. Permeance as tested after mandatory conditioning (ASTM E 154 sections 8,11,12,13) less than 0.01 Perms [grains/(ft2 *hr * in.Hg)]
   2. Other performance criteria
      a. Strength: ASTM E 1745 Class A
      b. Thickness: 15 mils minimum

2.2 ACCESSORIES

A. Seam Tape
   1. Tape must have the following qualities:
      a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
   2. Seam Tape
      a. Manufacturer's standard seam tape.
      b. Stego Crete Claw (for slabs on void boxes).

B. Vapor Proofing Mastic
   1. Mastic must have the following qualities:
      a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower

C. Pipe Boots
   1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
   1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Barrier/Retarder:
   1. Installation shall be in accordance with manufacturer's written instructions and ASTM E 1643-09.
      a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
      b. Lap Vapor Barrier/Retarder over footings or seal to foundation walls.
      c. Overlap joints 6 inches and seal with manufacturer's tape.
      d. Seal all penetrations (including pipes) per manufacturer's instructions.
      e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
      f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION 03 05 80

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete formwork, for the following:
   1. Footings and/or piers.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Suspended slabs.
   5. Concrete toppings.
   6. Building frame members.
   7. Building walls.

B. Related Sections:
   1. Section 01 45 23 “Testing and Inspection Services”.
   2. Section 03 30 00 “Cast In Place Concrete”.
   3. Section 03 20 00 “Concrete Reinforcing”.
   4. Section 03 38 16 “Unbonded Post Tensioned Concrete”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. American Concrete Institute (ACI):
      a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials
      b. ACI 301 – Specifications for Structural Concrete for Buildings
      c. ACI 318 – Building Code Requirements for Structural Concrete
      d. ACI 347 – Guide to Formwork for Concrete
      e. ACI SP-4 – Formwork for Concrete.

1.4 PERFORMANCE REQUIREMENTS

A. Design and engineering of formwork, including shores, reshores, false work, bracing, and other temporary supports as well as determining when temporary supports and bracing can safely be removed after the specified curing time is the Contractor’s responsibility.

B. All components of the formwork shall be designed to support all loads imposed during construction including weight of construction equipment, live loads, and lateral loads due to wind and imbalance or discontinuity of building components.

C. If any post tensioned members exist on the project, the formwork supporting those elements shall:
   1. It is essential to take into account the stressing sequence of post-tensioned concrete in the design of the formwork. Any concrete element which is stressed can transfer its weight off the form work to the supporting concrete element in which case the forms for the supporting concrete element must be designed to support the entire load tributary of that element.
   2. Forms shall be designed and constructed to permit movement during stressing, both lifting and shortening of the concrete elements.
   3. Formwork supporting beams and girders shall be designed to support the weight of the beam or girder's entire tributary area.
   4. Formwork supporting post tensioned concrete elements shall not be removed until all concrete supported by the formwork has been fully stressed, but in no case shall the curing time before form removal be less than specified herein.
   5. Design, engineering and production of shop drawings for the form work shall be performed under the supervision of a professional engineer.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Shop drawings for layout of pan type forms, if they exist on the project. Layout only - information and details about the support of these forms is not required, as it is the responsibility of the Contractor and his registered engineer
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

D. Manufacturer's product data and installation instruction for propriety materials used in exposed concrete work including form liners, release agents, form systems, ties, and accessories.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver form materials in manufacturer's packaging with installation instructions.

B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician. An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

B. Testing Agency Qualifications: Refer Section 01 45 23.

C. Layout and measurement of concrete forms and embedment's, required for work, performed by a licensed surveyor employed by the contractor.

D. Design, engineering and construction, and removal of formwork are the responsibility of the contractor.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete."
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Permanent Metal Forms for Slabs: Deck material, gauge and rib pattern shall be as noted on Drawings.

E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
   1. Pans shall be free of dents, irregularities, sag, rust or other deterioration.
   2. In areas permanently exposed to view, provide one piece units, manufactured to length between beams or ribs, or segmented units with reinforced butt-joint splices.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class B, 1/4 inch
   3. Class C, 1/2 inch
   4. Class D, 1 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts that are attached to the formwork.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.
   4. Install accessories in accordance with manufacturer’s instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

3. Determine compressive strength of in place concrete by testing representative field-cured test specimens according to ACI 301.

B. Obtaining concrete compressive strength tests for the purposes of form removal shall be the responsibility of the Contractor.

C. In the absence of cylinder tests, formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit (10 degrees Celsius) for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. When the surrounding air temperature is below 50 degrees Fahrenheit (10 degrees Celsius), that time period shall be added to the minimum listed time period.

D. Formwork for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span. Two-way conventionally reinforced slabs shall then be reshored until they attain the specified 28 day strength.

E. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems that allow form removal without displacing shores. However, the Contractor must demonstrate, to the satisfaction of the Architect, that the early removal of forms will not result in excessive sag, distortion or damage to the concrete elements.

F. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

G. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. The Contractor shall be solely responsible for proper shoring and reshoring. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

C. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement. Reshores shall be located in the same position on each floor. No construction loads shall be placed on the new construction until all supporting reshores have been installed.
1. Extend shores or reshores from ground to top level in structure three stories or less in height, unless noted otherwise.
2. In structures over three stories in height, extend shores or reshores at least three levels under the level being placed. Extend shores beyond the minimum number of levels if required to ensure proper distribution of loads throughout the structure.
3. In crawl spaces or basement, shores or reshores shall extend to mud pads seated firmly on the soil or to on grade construction.

D. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

E. Bottom tier of reshores shall remain in place until the supported concrete has attained at least 85 percent of the specified 28 day compressive strength and construction loads in excess of 20 psf have been removed but not less than 14 days.

3.5 REUSE OF FORMS

A. Clean and repair surfaces of forms to be used in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Otherwise, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are to be installed.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated or to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment

END OF SECTION 03 10 00

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete reinforcement, for the following:
   1. Footings and/or piers.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Suspended slabs.
   5. Concrete toppings.
   6. Building frame members.
   7. Building walls.

B. Related Sections:
   1. Section 01 45 23 “Testing and Inspection Services”.
   2. Section 03 10 00 “Concrete Forming and Accessories”.
   3. Section 03 30 00 “Cast In Place Concrete”.
   4. Section 03 38 16 “Unbonded Post Tensioned Concrete”.
   5. Section 04 22 00 “Concrete Unit Masonry”.
   6. Section 31 20 00 "Earth Moving".
   7. Section 31 63 29 "Drilled Concrete Piers and Shafts".

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. American Concrete Institute (ACI)
      a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
      b. ACI 301 – Specifications for Structural Concrete for Buildings
      c. ACI 315 – Details and Detailing of Concrete Reinforcement
      d. SP-66 ACI Detailing Manual
   2. American Welding Society (AWS)
      a. AWS D1.1 – Structural Welding Code
   3. Concrete Reinforcing Steel Institute (CRSI)
      a. CRSI – Manual of Standard Practice
      b. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
      c. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

B. American Society of Testing Materials (ASTM)
   a. ASTM-A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
   b. ASTM-A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
   c. ASTM-A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   d. ASTM-A675: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
   e. ASTM-A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   f. ASTM-A775: Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
   g. ASTM-A884: Standard Specification for Epoxy-Coated Wire and Welded Wire Reinforcement.

C. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement, according to ACI 315 “Details and Detailing of Concrete Reinforcement.”
   1. Do not reproduce the structural drawings for use as shop drawings.

C. Bar Supports: Submit manufacturer’s product information for bolsters, chairs, spaces, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency, installer, and fabricator as indicated herein.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Steel reinforcement and accessories.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Refer Section 01 45 23.

B. Installer Qualifications: An experienced installer who has completed reinforcing installation work similar in material, design, and extent to that indicated for this Project

and whose work has resulted in construction with a record of successful in service performance.

C. Fabricator Qualifications: An experienced fabricator who has completed reinforcing fabrication work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.

C. Low-Alloy-Steel Reinforcing Bars for bars to be welded: ASTM A 706, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.

D. Stainless-Steel Reinforcing Bars: ASTM A 955, Grade 60, [Type 304] [Type 316L], deformed.

E. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60 or ASTM A 706, deformed bars, assembled with clips.

F. Plain-Steel Wire: ASTM A 82, as drawn .

G. Deformed-Steel Wire: ASTM A 496.

H. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

I. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, or other unacceptable materials.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material. Bars used for concrete reinforcement shall meet following requirements for fabricating tolerances:
1. Sheared length: Plus or minus 1 inch.
2. Depth of truss bars: Plus 0, minus ½ inch.
3. Overall dimensions of stirrups, ties, and spirals: Plus or minus ½ inch.
4. Other bends: Plus or minus 1 inch.

B. For bars with end bearing splice couplers, bar ends shall terminate in flat surfaces, within 1.5 degrees of a right angle to axis of bars and shall be fitted within 3 degrees of full bearing after assembly.

2.4 DOWEL BAR ANCHORS/SPLICERS

A. A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published I.C.B.O. test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable.
1. Richmond Screw Anchor “Dowel Bar Splicer”
2. Erico “Lenton Form Saver”
3. Dayton Barsplice “Grip-Twist”

2.5 MECHANICAL SPLICES

A. A. Provide mechanical splices designed to develop, both in tension and compression, 125% of minimum ASTM yield strength of the smaller bar being coupled, as evidenced by published I.C.B.O test reports. The following bar splicing systems are acceptable.
   1. Erico “Cadweld C-Series”
   2. Erico “Lenton”
   3. Dayton Barsplice “Bar Grip”
   4. Dayton Barsplice “Grip Twist”

2.6 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

A. Steel Shapes and Plates: Conform to ASTM A36, “Specification for Structural Steel”.

B. Headed Stud Anchors: Headed studs welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

C. Welding Electrodes: AWS 5.5, Series E70.

D. Welded Deformed Bar Anchors: Welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

E. All metal assemblies exposed to earth, weather or moisture, including exposure to a crawl space environment, shall be hot dip galvanized.

2.7 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings,” and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full fusion process equal to that of TRW Nelson Stud Welding Division of KSM Welding Services Division, Omark, Ind. A minimum of two headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.

C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing laboratory. Under no circumstances is ordinary reinforcing (ASTM A615) to be welded.

D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.2 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Provide minimum concrete covering for reinforcement as shown in the Structural General Notes.

G. Place bars to following tolerances:
   1. Clear distance to formed surfaces: Plus or minus ¼ inch.
   2. Minimum spacing between bars: Minus ¼ inch.
   3. Top bars in slabs and beams:
      a. Members 8 inches deep or less: Plus or minus ¼ inch.
      b. Members between 8 and 24 inches deep: Plus or minus ½ inch.
      c. Members more than 24 inches deep: Plus or minus 1 inch.
   4. Crosswise of members: Spaced evenly within 2 inches.
   5. Length of members: Plus or minus 2 inches.

H. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter, or enough to exceed above tolerances, resulting arrangement of bars subject to approval.

I. Support reinforcement and fasten together to prevent displacement by construction loads or placing concrete beyond tolerances indicated.

J. Unless permitted by Engineer, do not bend reinforcement after embedding in hardened concrete.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 21 00
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This WORK shall consist of furnishing and placing reinforcing steel in accordance with these SPECIFICATIONS and in conformity with the DRAWINGS.

1.02 RELATED SECTIONS

A. The following is a list of SPECIFICATIONS which may be related to this section:

1. Section 03 10 00, Concrete Forming and Accessories.

2. Section 03 33 00, Cast-in-Place Concrete.

1.03 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):

a. SP-66, ACI Detailing Manual.

b. 117, Specifications for Tolerance for Concrete Construction and Materials.

c. 301, Specifications for Structural Code.

d. 318, Building Code Requirements for Structural Concrete.

2. American Welding Society (AWS):

a. D1.1/D1.1M, Structural Welding Code - Steel.

b. D1.4/D1.4M, Structural Welding Code - Reinforcing Steel.

3. ASTM International (ASTM):

a. A82/A82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

b. A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

d. A706/A706M, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

4. Concrete Reinforcing Steel Institute (CRSI):

a. Manual of Standard Practice.

b. Placing Reinforcing Bars.

1.04 SUBMITTALS

A. Two copies of a list of all reinforcing steel and bending diagrams shall be furnished to the ENGINEER at the site of the work at least one week before the placing of reinforcing steel is begun. Such lists will not be reviewed for accuracy. The CONTRACTOR shall be responsible for the accuracy of the lists and for furnishing and placing all reinforcing steel in accordance with the details shown on the plans.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Reinforcing steel shall be stored off of the ground and protected from oil or other materials detrimental to the steel or bonding capability of the reinforcing bar. Epoxy coated reinforcing bars shall be stored on protective cribbing.

PART 2 – PRODUCTS

2.01 REINFORCING STEEL

A. Deformed Bars: All bar steel reinforcement shall be of the deformed type, ASTM A615, AASHTO M31M/M31, and Grade (40 or 60) as specified on the DRAWINGS. B. Spirals:

1. Spirals, hot-rolled plain or deformed bars per ASTM A615, Grade 60 or cold drawn wire per ASTM A82/A82M as specified on the DRAWINGS.

2. Spirals for columns shall have two (2) “spacers” with a section modulus >0.030in^3 in order to maintain the proper pitch and spacing.

B. Welded Wire Fabric: All welded wire fabric reinforcement shall conform to ASTM A497/A497M. F. Identification:

1. Bundles of reinforcing bars and wire spirals shall be tagged, with a metal tag, showing specification, grade, size, quantity, and suitable identification to permit checking, sorting, and placing. When bar marks are used to identify reinforcing bars on the DRAWINGS, the bar mark shall be shown on the tag. Tags shall be removed prior to concrete placement.

2. Bundles of flat sheets and rolls of welded wire fabric shall be tagged similar to reinforcing bars.

2.02 TIE WIRE

A. 16-gauge wire ties, manufactured by American Wire Tie, Inc., or equal. When epoxy coated reinforcing steel is shown on the DRAWINGS, PVC coated wire ties shall be used. The minimum PVC coating shall be 0.7 mils.

2.03 BAR SUPPORTS

A. General: Bar supports and spacing shall be in accordance with the CRSI Manual of Standard Practice, Chapter 3, a maximum of four (4) feet, or as required by the DRAWINGS.

B. Floor Slabs: Uncoated steel or non-metallic composite chairs shall be used unless otherwise shown on the DRAWINGS. If required by ENGINEER, the chair shall be stapled on a bearing pad to prevent chair displacement. The bearing pad shall be made of exterior grade plywood and be approximately five (5) inches square.

C. Columns: Plastic “space wheels” manufactured by Aztec (Model DO 12/40), or equal, are required.

D. Epoxy-Coated and Zinc-Coated Bar Supports: Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports made of dielectric or other acceptable materials. Wire supports shall be fully coated with dielectric material, compatible with concrete. Reinforcing bars used as support bars shall be epoxy-coated. In walls reinforced with epoxy-coated bars, spreader bars shall be epoxy-coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcing shall be made of corrosion-resistant material or coated with dielectric material.

2.04 FABRICATION

A. Fabrication tolerances for straight and bent bars shall be in accordance with the requirements of Subsection 4.3, Tolerance, of ACI 315 and the CRSI Manual of Standard Practice.

PART 3 – EXECUTION

3.01 GENERAL

A. Rust, seams, surface irregularities, or mill scale shall not be cause for rejection provided that the weight and height of deformations of a hand-wire-brushed test specimen are not less than the applicable ASTM Specification.

3.02 BAR LIST

A. CONTRACTOR shall be responsible for the accuracy of the lists and for furnishing and placing all reinforcing steel in accordance with the details shown on the DRAWINGS.

B. Bar lists and bending diagrams for structures, which are included on the DRAWINGS, do not have to be furnished by CONTRACTOR. When bar lists and bending diagrams are included on the DRAWINGS, they are intended for estimating approximate quantities. CONTRACTOR shall verify the quantity, size, and shape of the bar reinforcement against those shown on the DRAWINGS and make any necessary corrections before ordering.

3.03 BENDING

A. All reinforcing bars shall be bent cold. Bars partially embedded in concrete shall not be field bent, except as shown on the DRAWINGS or permitted. Bars shall not be bent or straightened in a manner that may injure the material.

3.04 PLACING AND FASTENING

A. When placed in the WORK, the reinforcing bars shall be free from dirt, loose mill scale, paint, oil, loose rust, or other foreign substance.

B. The placing, fastening, splicing, and supporting of reinforcing steel and wire mesh or bar mat reinforcement shall be in accordance with the DRAWINGS and the latest edition of “CRSI Placing Reinforcing Bars.” In case of discrepancy between the DRAWINGS and the CRSI publication stated above, the DRAWINGS shall govern. Reinforcement shall be placed within the tolerances provided in ACI 117.

C. Steel reinforcement shall be accurately placed in the positions shown on the DRAWINGS and firmly held during the placing and setting of concrete by means of spacer strips, stays, metal chairs or other approved devices or supports. Precast concrete bricks or other types of bricks are not permitted for support of reinforcement in footings, slabs, or any other part of the work. Chair and bolster supports for slabs and walls shall be spaced at a maximum of four- (4-) foot centers unless otherwise shown on the DRAWINGS. Staples used to attach bar supports to wall and roof forms shall have the staple “tails” clipped after form removal. For columns, three (3) wheels, spaced one hundred twenty degrees (120°) apart, shall be placed every four (4) feet of column height. CONTRACTOR may increase the column spiral pitch if a conflict occurs with the wheel. Pre-tied column reinforcing steel lowered into column forms shall be lowered vertically to prevent damage to the space wheels.

D. Bars shall be securely tied at fifty percent (50%) of all intersections except where spacing is less than one (1) foot in each direction, when alternate intersections shall be tied unless otherwise called out on the DRAWINGS or in applicable SPECIFICATIONS. Tying of steel by spot welding shall not be permitted unless specifically authorized by ENGINEER. The placing and securing of the reinforcement in any unit or section shall be accepted by ENGINEER before any concrete is placed in any such unit or section.

E. Bundle bars shall be tied together at not more than six- (6-) foot centers.

3.05 SPLICING

A. Bar steel reinforcement shall be furnished in the full lengths indicated on the DRAWINGS. Splicing of bars, except where shown on the DRAWINGS, shall not be permitted without the written acceptance of ENGINEER. Splices shall be staggered. In cases where permission is granted to splice bars, other than those shown on the DRAWINGS, the additional material required for the lap shall be furnished by CONTRACTOR at CONTRACTOR’s own expense. The minimum distance between staggered splices for reinforcing bars shall be the length required for a lapped splice in the bar. All splices shall be full contact splices.

B. Splices shall not be permitted at points where the section is not sufficient to provide a minimum distance of two (2) inches between the splice and the nearest adjacent bar or the surface of the concrete.

C. Welding of reinforcement shall be done only if detailed on the DRAWINGS or if authorized by ENGINEER in writing. Welding shall be done by a certified welder. The welding shall conform to AWS D1.4/D1.4M with the modifications and additions specified hereinafter. Where AWS D2.0 Specifications for Welded Highway and Railway Bridges is referenced, the reference shall be construed to be for AWS D1.1. Where the term AWS D1.1/D1.1M is used it shall mean the American Welding Society Structural Welding Code, D1.5/D1.5M as modified and amended by the AASHTO Standard Specifications for Welding of Structural Steel Highway Bridges. After completion of welding, coating damage to coated reinforcing steel bars shall be repaired.

D. When required or permitted, a mechanical connection may be used to splice reinforcing steel bars or as substitution for dowel bars. The mechanical connection shall be capable of developing a minimum of one hundred twenty five percent (125%) of the yield strength of the reinforcing bar in both tension and compression. All parts of mechanical connections used on coated bars, including steel splice sleeves, bolts, and nuts shall be coated with the same material used for repair of coating damage.

3.06 CUTTING

A. When coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

END OF SECTION 03 21 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Suspended slabs.
   5. Concrete toppings.
   6. Building frame members.
   7. Building walls.

B. Related Sections:
   1. Section 01 45 23 “Structural Testing and Inspection Services”.
   2. Section 03 20 00 "Concrete Forming and Accessories".
   3. Section 03 10 00 "Concrete Reinforcing".
   4. Section 03 15 13 “Waterstops”.
   5. Section 03 05 80 “Under-slab Vapor Barrier – Retarder”.
   6. Section 31 63 29 “Drilled Concrete Piers and Shafts”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. ACI 301 – Specification for Structural Concrete.
   2. ACI 302 – Guide for Concrete Floor Slab Construction.
   3. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete.
   4. ACI 305 – Hot Weather Concreting.
   5. ACI 306 – Cold Weather Concreting.
   6. ACI 308 – Guide to Curing Concrete.
   7. ACI 309 – Guide for Consolidating Concrete.
   8. ACI 311 – ACI Manual for Concrete Inspection.
   9. ACI 318 – Building Code Requirements for Reinforced Concrete.
   10. ACI 347 – Guide to Concrete Formwork.
   11. ACI 207 – Mass Concrete.
   12. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   13. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

14. ACI 212.3 – Chemical Admixture for Concrete.
15. ACI 212.4 – Guide for the use of High Range Water Reducing Admixtures in Concrete.
16. ACI 214 – Evaluation of Strength Test Results of Concrete.
17. ACI 303 – Guide to Cast in Place Architectural Concrete Practice.
18. Concrete Reinforcing Steel Institute, “Manual of Standard Practice”.

B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture include the following information. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Each proposed mix design shall be accompanied by a complete standard deviation analysis based on at least 30 consecutive strength tests, or by three laboratory trial mixtures with confirmation tests.
2. Proportions of cement, fine, and coarse aggregate, and water.
3. Design strength.
4. Maximum slump.
5. Air Content.
6. Maximum water / cement ratio.
7. Maximum and minimum concrete temperature that is acceptable at time of placement for which the manufacturer can guarantee the strength of the concrete.
8. Type cement and aggregates.
9. Type and quantities of all admixtures.
10. Air dry density and splitting tensile strength for lightweight concrete determined in accordance with ASTM 330.
11. Type, color, and quantities of integral coloring compounds, where applicable.
12. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Refer Section 03 20 00.

D. Formwork Shop Drawings: Refer Section 03 10 00.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Semi rigid joint filler.
9. Joint-filler strips.
10. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: See Section 01 45 23.
1. Contractor’s responsibility to testing laboratory.
   a. Furnish all labor and materials as required to assist testing agency in obtaining, making and handling samples at the jobsite.
   b. Advise the Owner’s Testing Laboratory sufficiently in advance of operations to allow adequate time for the assignment of testing personnel.
   c. Furnish and maintain adequate facilities for proper curing of concrete test specimens on the project site in accordance with ASTM C31.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.

H. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. See Section 03 10 00.

2.2 STEEL REINFORCEMENT

A. See Section 03 20 00.

2.3 REINFORCEMENT ACCESSORIES

A. See Section 03 20 00.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I or Type I/II, gray. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class F or C. Carbon content shall not exceed 3 percent by volume.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 1-1/2 inches, 1 inch, or 3/4 inch nominal as indicated on Drawings for specific uses.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

D. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that contain not more than 0.05 percent water soluble chloride ions. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. Retarding Admixture: ASTM C 494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ChemMasters.
      b. Davis Colors.
      c. Dayton Superior Corporation.
      d. Hoover Color Corporation.
      e. Lambert Corporation.
      f. QC Construction Products.
      g. Rockwood Pigments NA, Inc.

h. Scofield, L. M. Company.
i. Solomon Colors, Inc.

2. Color: As selected by Architect from manufacturer's full range.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1 to 2-1/4 inches long.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. 3M; Scotchcast Polyolefin Fibers 2".
   b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
   c. FORTA Corporation; FORTA FERRO.
   d. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
   e. Nycon, Inc.; XL.
   f. Propex Concrete Systems Corp.; Fibermesh 650.
   g. Sika Corporation; Sika Fiber MS or MS10.

2.7 CONCRETE MIX DESIGNS

A. Selection of Proportions: Proportions of ingredients for concrete mixes shall be determined by a qualified concrete supplier in accordance with the requirements of ACI 301.

B. Required average strength above specified strength: Determination of required average strength above specified strength shall be based on the standard deviation record of the production facility in accordance with ACI 301. Calculation of standard deviation of compressive strength results shall be made in accordance with ACI 214. If a suitable record of strength tests is not available, proportions shall be selected on the basis of laboratory trial batches to produce an average strength greater than the strength f'c by the amount defined in ACI 301.

2.8 VAPOR RETARDERS

A. See Section 03 05 80.

2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 8 sieve.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Anti-Hydro International, Inc.; Emery.
   b. Dayton Superior Corporation; Emery Tuff Non-Slip.
   c. Lambert Corporation; EMAG-20.
   d. L&M Construction Chemicals, Inc.; Grip It.
   e. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Anti-Hydro International, Inc.; A-H Alox.
      b. BASF Construction Chemicals - Building Systems; Frictex NS.
      c. L&M Construction Chemicals, Inc.; Grip It AO.

2.10 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ChemMasters; Chemisil Plus.
      b. ChemTec Int'l; ChemTec One.
      c. Conspec by Dayton Superior; Intraseal.
      d. Curecrete Distribution Inc.; Ashford Formula.
      e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
      f. Edoco by Dayton Superior; Titan Hard.
      g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      h. Kaufman Products, Inc.; SureHard.
      i. L&M Construction Chemicals, Inc.; Seal Hard.
      j. Meadows, W. R., Inc.; LIQUI-HARD.
      k. Metalcrete Industries; Floorsaver.
      l. Nox-Crete Products Group; Duro-Nox.
      m. Symons by Dayton Superior; Buff Hard.
      n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
      o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Advanced Floor Products; Retro-Plate 99.
      b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
      c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
      b. BASF Construction Chemicals - Building Systems; Confilm.
      c. ChemMasters; SprayFilm.
      d. Conspec by Dayton Superior; Aquafilm.
      e. Dayton Superior Corporation; Sure Film (J-74).

f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; Vapor-Aid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.

g. Lambert Corporation; UV Safe Seal.
h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
i. Meadows, W. R., Inc.; Vocomp-30.
j. Metalcrete Industries; Metcure 30.
k. Right Pointe; Right Sheen WB30.
l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.12 RELATED MATERIALS

A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.13 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, as indicated in Structural General Notes.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.15 NON-SHRINK GROUT

A. Grout shall be prepackaged, non metallic, and non gaseous. It shall be non-shrink when tested in accordance with ASTM-C1107 Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through the flow cone after slight agitation, in temperatures of 40 degrees to 90 degrees Fahrenheit. Grout shall be bleed free and attain 7,500 psi compressive strength in 28 days at fluid consistency. Certified independent test data required. Approved products include the following:
   1. “Euco NS” by Euclid Chemical Company
   2. “Masterflow 713” by Master Builders.

2.16 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as indicated in Structural General Notes:

2.17 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.18 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. See Section 03 10 00.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. See Section 03 10 00.

3.4 SHORES AND RESHORES

A. See Section 03 10 00.

3.5 VAPOR RETARDERS/BARRIERS

A. See Section 03 05 80.

3.6 STEEL REINFORCEMENT

A. See Section 03 20 00

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are specified or otherwise indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Do not permit concrete to drop freely any distance greater than 10’-0” for concrete containing a high range water reducing admixture or 5’-0” for other concrete. Provide chute or tremie to place concrete where longer drops are necessary. Do not place concrete into excavations with standing water. If place of deposit cannot be pumped dry, pour concrete through a tremie with its outlet near the bottom of the place of deposit.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

H. Hot-Weather Placement: Comply with ACI 305 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. See Section 03 10 00.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated and/or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated and/or to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and/or exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces according to ASTM E 1155, for a randomly trafficked floor surface.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistivegranules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive granules.

3.11 Concrete Floor Finish Tolerances

A. Interior Finish Floor surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System." The following values apply before removal of shores. Levelness values F(L) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.
1. Exposed, vinyl tiled, or thin-set tiled floors: Specified overall values of flatness, Ff =35; and levelness, Fl =25; with minimum local values of flatness, Ff =24; and levelness, Fl =17.
2. Carpeted floors, floors under concrete toppings, thickset tile and terrazzo: Specified overall values of flatness, Ff =25; and levelness, Fl = 20; with minimum local values of flatness, Ff =17; and levelness, Fl =15.

B. Floor Elevation Tolerance Envelope:
1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:
a. Slab-on-Grade, or Slab-on-Void Construction: +/- 3/4"
b. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"
c. Top surfaces of all other slabs: +/- 3/4"
d. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at

correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing

compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturers written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
   2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
   3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
   4. Control and dispose of waste products produced by grinding and polishing operations.
   5. Neutralize and clean polished floor surfaces.

C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate.

Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
   2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 03 5400

SELF-LEVELING UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use gypsum-based type at areas requiring acoustical remediation.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Certificate: Certify that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility or flame spread requirements.

1.6 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Underlayment:
   1. ARDEX Engineered Cements; ARDEX GS-4: www.ardexamericas.com.
   2. Maxxon Corporation ; Product Gyp-Crete: www.maxxon.com
   3. USG; Levelrock: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:

1. Compressive Strength: Minimum 2000 psi, tested per ASTM C472.
2. Density: Maximum 115 lb/cu ft.
3. Final Set Time: 1 to 2 hours, maximum.
4. Thickness: 1 inch.
5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 inaccordance with ASTM E84.

B. Acoustical Matting Beneath Gypsum Underlayment at Hard Surfaced Floors: Equal to Acoustimat II by Maxxon.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

D. Water: Potable and not detrimental to underlayment mix materials.

E. Primer: Manufacturer's recommended type.

F. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi- products, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.
1. Pump, move, and screed while the material is still highly flowable.
2. Be careful not to create cold joints.
3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

3.4 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.5 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

3.6 FIELD QUALITY CONTROL (GYPSUM UNDERLAYMENT)

A. During each day's product application,
   1. Mold and test one set of 3 test cubes of gypsum concrete in accordance with ASTMC472, and other procedures as recommended by manufacturer. Furnish report on dry density and compressive strength to Architect and Owner upon request.
   2. Perform one slump test with a 2 inch diameter x 4 inch tall cylinder. Acceptablerange of patty after cylinder is removed is 8 inch diameter (+/- 1 inch).

END OF SECTION

SECTION 04 0100

MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water cleaning of existing masonry surfaces.

B. Repointing mortar joints.

C. Repair of damaged masonry.

1.2 RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout.

1.3 ABBREVIATIONS AND ACRONYMS

A. CFRP: Carbon Fiber Reinforced Polymer.

1.4 REFERENCE STANDARDS

A. ACI SPEC-548.14 - Specification for Repairing Concrete with Epoxy Mortar 2014.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

B. Scheduling:
   1. Perform cleaning and washing of masonry between the hours of 7 am to 7 pm only.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds.

1.7 QUALITY ASSURANCE - MASONRY WORK

A. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials in covered, well-ventilated area protected from exposure to detrimental conditions, including airborne contaminants, dirt, dust, sunlight, temperatures lower than 40 degrees F (4 degrees C) or greater than 100 degrees F (38 degrees C), rainfall, sparks, or flame, and in accordance with the manufacturer's requirements. Store polymer resins and hardeners in separate area from construction materials that can absorb odors.

1.9 FIELD CONDITIONS - MASONRY WORK

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

D. Do not blast clean or use process creating dust, dirt, when wind is over 10 mph (16 kph).

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Warranty: Provide 5-year warranty for CFRP system design, installation, bond to the substrate, and interlaminar bond, as well as mechanical property retention and fabric-resin compatibility, commencing on Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 = PRODUCTS

2.1 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

2.2 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

B. Verify that masonry surfaces to receive CFRP are as dry as recommended by CFRP system manufacturer. Evaluate moisture content in accordance with ACI SPEC-548.14.

3.2 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

3.3 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch (6 mm) layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.4 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at all locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.5 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

SECTION 04 0511

MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.2 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.

C. ASTM C91/C91M - Standard Specification for Masonry Cement.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

F. ASTM C150/C150M - Standard Specification for Portland Cement.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

K. ASTM C476 - Standard Specification for Grout for Masonry.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

N. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

O. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar.

P. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

Q. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength.

R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.

1.3 SUBMITTALS

A. See Division 1 sections for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.6 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Mix Designs: ASTM C270, Property Specification.

2.2 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, graded sand, and chemical admixtures complying with ASTM C91/C91M with the addition of water only.

C. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

D. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal.

E. Masonry Cement: ASTM C91.
   1. Type: Type N.

F. Hydrated Lime: ASTM C207, Type S.

G. Quicklime: ASTM C5, non-hydraulic type.

H. Mortar Aggregate: ASTM C144.

I. Grout Aggregate: ASTM C404.

J. Water: Clean and potable.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.4 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

2.5 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4300 - Quality Assurance.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.

2.6 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
   1. Masonry below grade and in contact with earth; Type S.
   2. Exterior, non-loadbearing masonry; Type N.
   3. Interior, non-loadbearing masonry; Type N.

B. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1 PREPARATION

A. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

3.3 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.4 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions Division 1 sections.

END OF SECTION

SECTION 04 0100

MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water cleaning of masonry surfaces.

B. Repointing mortar joints.

C. Repair of damaged masonry.

D. Surface reinforcing of bowed, cracked, and weakened masonry with CFRP.

1.2 RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout.

B. Section 04 2001 - Masonry Veneer.

C. Section 04 2200 – Concrete Unit Masonry: Concrete masonry units.

1.3 ABBREVIATIONS AND ACRONYMS

A. CFRP: Carbon Fiber Reinforced Polymer.

1.4 DEFINITIONS

A. Carbon Fiber Reinforced Polymer: Composite material comprising a polymer matrix reinforced with carbon fiber cloth, mat, or strands.

1.5 REFERENCE STANDARDS

A. ACI PRC-440.7 - Externally Bonded Fiber-Reinforced Polymer Systems Design and Construction for Strengthening Masonry Structures - Guide; 2022.

B. ACI SPEC-440.8 - Specification for Carbon and Glass Fiber-Reinforced Polymer (FRP) Materials Made by Wet Layup for External Strenghening of Concrete and Masonry Structures; 2013.

C. ACI SPEC-548.14 - Specification for Repairing Concrete with Epoxy Mortar; 2014.

D. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

E. ASTM D3039/D3039M - Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials; 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

G. ICC-ES AC125 - Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber-Reinforced Polymer (FRP) Composite Systems; 2021, with Editorial Revision (2022).

H. ICC-ES AC178 - Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) or Steel-Reinforced Polymer (SRP) Composite Systems; 2017, with Editorial Revision (2020).

I. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

B. Scheduling:
   1. Perform cleaning and washing of masonry between the hours of 7 am to 11 pm only.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds.

C. Product Data: Provide manufacturer's product data and MSDS sheets on CFRP systems, including physical and chemical characteristics, material specifications for each component, limitations on use of system, construction or application instructions, maintenance instructions, and general manufacturer's recommendations regarding each system.

D. Samples: Two CFRP plates, 12 by 12 inches in size.

E. CFRP Manufacturer's Instructions:
   1. Mixing instructions.
   2. Curing times between coats or layers.
   3. Application procedures for surface coatings.
   4. Application procedures of top coating material.

F. CFRP manufacturer's qualification statement.

G. CFRP installer's qualification statement.

1.8 QUALITY ASSURANCE - MASONRY WORK

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.9 QUALITY ASSURANCE - CFRP WORK

A. Quality Control Plan: For installation and curing of CFRP materials, including personnel safety, installer certification, application and inspection of CFRP system, location and placement of splices, curing provisions, means to assure dry surfaces, quality assurance samples, and cleanup.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Deliver polymer resin materials in original factory-sealed containers with manufacturer's labels intact and legible with verification of product nomenclature, manufacturer's name, product identification and batch number, date of manufacture, and shelf life or expiration date. Do not use polymer resin materials that have exceeded shelf life.

C. Store materials in covered, well-ventilated area protected from exposure to detrimental conditions, including airborne contaminants, dirt, dust, sunlight, temperatures lower than 40 degrees F (4 degrees C) or greater than 100 degrees F (38 degrees C), rainfall, sparks, or flame, and in accordance with the manufacturer's requirements. Store polymer resins and hardeners in separate area from construction materials that can absorb odors.

1.11 FIELD CONDITIONS - MASONRY WORK

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

1.12 FIELD CONDITIONS - CFRP WORK

A. Maintain materials and surrounding air temperature to minimum 55 degrees F prior to, during, and 48 hours after completion of CFRP work.

B. Do not apply primers, saturating resins, and adhesives to cold or frozen surfaces.

C. Do not use supplemental sources of heat to raise air or masonry surface temperature unless approved by the CFRP system manufacturer.

D. Do not apply resins and adhesives to damp or wet surfaces unless they have been formulated for such applications.

E. Provide temporary protection from direct contact by rain, dust and dirt, excessive sunlight, and high humidity during installation and until resins have cured.

1.13 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Warranty: Provide 5-year warranty for CFRP system design, installation, bond to the substrate, and interlaminar bond, as well as mechanical property retention and fabric-resin compatibility, commencing on Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Restoration and Cleaning Chemicals:
   1. Diedrich Technologies, Inc; www.diedrichtechnologies.com.
   2. HMK Stone Care System; www.hmkstonecare.com.
   3. PROSOCO; www.prosoco.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

2.3 CFRP SYSTEMS

A. Manufacturers:
   1. Fortress Stabilization Systems; www.fortressstabilization.com.
   2. Master Builders Solutions; www.master-builders-solutions.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. CFRP Systems:
   1. Wet Layup CFRP System: Dry unidirectional or multidirectional carbon fiber sheets or fabrics are impregnated on-site with saturating epoxy resin to bond sheets to masonry surfaces. Wet layup systems are saturated with resin prior to placement on masonry surfaces and cured in place.

C. Design Criteria:
   1. Design the CFRP system in conformance with ACI PRC-440.7 to provide seismic, wind, and blast strengthening for clay and concrete masonry walls.
   2. Comply with ICC-ES AC125 Acceptance Criteria.
   3. Comply with ICC-ES AC178 Acceptance Criteria.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
   5. VOC Content Limits: As specified in Section 01 6116.

2.4 CFRP MATERIALS

A. Liquid Epoxy Adhesive: Two-component, 100 percent solids, moisture-tolerant, low to medium viscosity, high strength, low modulus, multipurpose; comply with ACI SPEC-440.8; comply with ASTM C881/C881M for Types I, II, IV, and V, Grade 2, Classes B and C. Uses include:
   1. Wet or dry layup of unidirectional or bidirectional carbon fiber to create CFRP system in masonry construction.
   2. Fill voids and cracks in masonry construction.

B. Bidirectional Carbon Fiber: For application to masonry construction with liquid epoxy adhesive for crack repair and reinforcement.

2.5 CFRP ACCESSORIES

A. Epoxy Injection Adhesive: For bonding cracked surfaces together in masonry construction.

B. Epoxy Paste: Two-component, 100 percent solids, moisture-insensitive, high strength, high modulus, multipurpose liquid epoxy gel adhesive; comply with ASTM C881/C881M for Types I, II, IV, and V, Grade 3, Classes B and C. Uses include:

C. Primer: To saturate and penetrate masonry surface and enhance bond strength of CFRP system. Wet layup systems typically require primers.

2.6 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

B. Mortar for pointing to be mixed specifically according to manufacturer's instructions for pointing mortar.

2.7 MASONRY MATERIALS

A. Brick: Section 04 2001.

B. Block: Section 04 2200.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

B. Verify that masonry surfaces to receive CFRP are as dry as recommended by CFRP system manufacturer. Evaluate moisture content in accordance with ACI SPEC-548.14.

3.2 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

E. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

F. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.3 PREPARATION - CFRP

A. Surface Preparation:
   1. Repair all cracks by using hydraulic cement or epoxy paste before installing carbon fiber.

2. Cleaning: Remove loose and unsound materials and other conditions that would inhibit bond, such as laitance, dust, dirt, oil, curing compound, existing paint or coatings, efflorescence, and other matter that could interfere with bond of CFRP system to masonry or repaired surfaces to which CFRP system is to be applied.
3. Old Clay Masonry: Prepare surface using hand tools, power tools, or water blasting techniques. Do not use abrasive blasting.
4. Old Concrete Masonry: Prepare surface by blasting with light blast abrasive or by cleaning with hand tools, power tools, or water blasting techniques.
5. Apply primers to areas on masonry surface where CFRP system is to be placed. Place primer uniformly on prepared surface at manufacturer's specified rate of coverage. Allow primer to cure to degree specified by CFRP manufacturer before applying subsequent materials.
6. Apply CFRP composite system to prepared wall within 72 hours of performing surface preparation.

B. Mortar Joint Preparation:
1. Tooled Mortar Joints: Fill with putty or epoxy paste to make mortar joints flush with masonry units. Ensure that localized, out-of-plane variations between masonry units do not exceed 1/16 inch or tolerances recommended by the CFRP system manufacturer, whichever is smaller. Smooth localized, out-of-plane variations in the masonry units using putty or epoxy paste as needed. Fill holes greater than 1/4 inch in diameter and other voids with putty or epoxy paste.
2. Untooled Mortar Joints: Grind or chisel flush with surface protuberances, irregularities, or untooled mortar joints that protrude beyond masonry surface.

C. Mixing:
1. Primers:
a. Mix primers according to CFRP system manufacturer's installation instructions. Assure resin components are at proper temperature and mixed in manufacturer's prescribed mix ratio for its prescribed mixing time until there is uniform and complete mixing of components.
2. Resins:
a. Mix resins in accordance with CFRP system manufacturer's recommended procedure. Assure that resin components are at proper temperature and are mixed in correct ratio until there is complete mixing of components and uniform color.
b. Mix each batch of resin in quantities sufficiently small to ensure that mixed resin can be used within the resin pot life. Do not use mixed resin that exceeds its pot life, as defined by CFRP system manufacturer.

3.4 INSTALLATION - CFRP

A. Wet Layup, Dry Layup, and Prepreg Systems:
1. Install in accordance with manufacturer's written instructions and approved shop drawings.
2. Apply sufficient saturating resin to achieve full saturation of the fibers in accordance with manufacturer's specifications.
3. Release or roll out entrapped air between layers before resin sets.
4. Place successive layers of saturating resin and fiber materials before complete cure of previous layer of resin.
5. Handle sheet and fabric materials in manner to maintain the fiber straightness and orientation. Remove and repair fabric kinks, folds, or other forms of severe waviness.

B. Curing of Resins:
1. Inspect the primer and CFRP resin to ensure proper cure according to manufacturer's recommendation.
2. Do not modify resin chemistry in field.

3.5 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry as directed.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work, mixed specifically per manufacturer's instruction for pointing work.

F. Ensure that anchors are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.6 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1 inch (6 mm) depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. When cutting is complete, remove dust and loose material by brushing.

E. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch (6 mm) layers. Form a smooth, compact concave joint to match existing.

F. Moist cure for 72 hours.

3.7 FIELD QUALITY CONTROL - CFRP

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspect installation and test for compliance with ICC-ES AC178.

C. Inspect for voids, bubbles, and delaminations by performing a visual and acoustic tap test of layered surface after 24 hours of initial resin saturant cure.

D. Test for material properties of CFRP in accordance with ASTM D3039/D3039M.

E. Nonconforming Work: Repair defective work after minimum cure time for CFRP laminates.

3.8 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at designated locations with detergent type cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.9 RESTORATION CLEANING

A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

B. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.

C. Rinse from the bottom up with potable water applied at 400 psi and at a rate of 4 gal/min.

3.10 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

SECTION 04 2001

BRICK VENEER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clay Facing Brick.

B. Mortar and Grout.

C. Reinforcement and Anchorage.

D. Flashings.

E. Installation of Lintels.

F. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout.

B. Section 07 9000 - Joint Sealers: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.

D. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

E. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

F. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

1.4 SUBMITTALS

A. See Division 1 sections for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.

C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar and accessories and structural backup in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of the Work, following approval.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.8 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 BRICK UNITS

a. Facing Brick: ASTM C216, Type FBS Smooth Face, Grade SW.
   1. Manufacture, Color and Texture: As designated in the Exterior Finish Schedule on the Drawings.
   2. Nominal Size: Match existing size.
   3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.2 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.3 REINFORCEMENT AND ANCHORAGE

A. Masonry Veneer Anchors: Brick Veneer to Concrete Masonry Units:
   1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. Basis of Design Product: 170-2X Truss Eye-Wire, adjustable reinforcement with 2x-Hook, manufactured by Hohmann & Barnard, Inc.
      a. Sized to accommodate wall widths detailed on the drawings.
   3. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Masonry Veneer Anchors: Brick Veneer to Cold Formed Metal Framing:
   1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. Basis of Design Product: HB-213-2X, adjustable veneer anchor, manufactured by Hohmann & Barnard, Inc.
      a. Sized to accommodate wall widths detailed on the drawings.
   3. Substitutions: See Section 01 2500 - Substitution Procedures.

C. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.4 FLASHINGS

A. Stainless Steel Flashing - Self-adhering: ASTM A240; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner.
   1. Manufacturers
      a. 3GEN Masonry Products; GENFLASH SS SA: www.3genmap.com
      b. STS Coatings, Inc; www.stscoatings.com.
      c. VaproShield, LLC; www.vaproshield.com
      d. York Manufacturing, Inc; York 304: www.yorkmfg.com
   2. Substitutions: See Section 01 2500 – Substitution Procedures.

B. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

2.5 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com/#sle.

b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
c. WIRE-BOND: www.wirebond.com/#sle.
d. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding; in maximum lengths available.
1. Manufacturers:
a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
b. WIRE-BOND: www.wirebond.com/#sle.
c. Substitutions: See Section 01 2500 - Substitution Procedures.

C. Weeps: Molded honeycomb grilles, insect resistant.
1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
2. Basis of Design Product: Quadro-Vent, manufactured by Hohmann & Barnard, Inc.
a. Size: 3/8” x 3-3/8” x 2-1/2”.
3. Substitutions: See Section 01 2500 - Substitution Procedures.
2. Color: To be selected by Architect from manufacturer’s full range of colors.

D. Cavity Mortar Control: High density polyethylene mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Panels to be installed at flashing locations.
2. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
3. Basis of Design Product: Mortar Trap, manufactured by Hohmann & Barnard, Inc.
4. Substitutions: See Section 01 2500 - Substitution Procedures.

E. Termination Bars: Stainless steel; compatible with membrane and adhesives.
1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
2. Basis of Design Product: T1 Termination Bar, manufactured by Hohmann & Barnard, Inc.
3. Substitutions: See Section 01 2500 - Substitution Procedures.

F. Drip Edge: Stainless steel; compatible with membrane and adhesives.
1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.
2. Basis of Design Product: DP Drip Plate, manufactured by Hohmann & Barnard, Inc.
3. Provide factory fabricated stainless steel corners and end dams at inside and outside corners.
4. Substitutions: See Section 01 2500 - Substitution Procedures.

G. Corners and End Dams: Provide factory fabricated stainless steel corners and end dams at inside and outside corners, below flashing.
1. Basis of Design Manufacturer: Hohmann & Barnard, Inc: www.h-b.com/#sle.

H. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

I. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   1. Bond: As indicated for different locations.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.3 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar as work progresses.

D. Interlock intersections and external corners, except for units laid in stack bond.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.4 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.5 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.6 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at spacings vertically and horizontally that comply with applicable codes. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Embed anchors to bond veneer at spacings vertically and horizontally that comply with applicable codes. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center. Place piece of self-adhering flashing behind anchor at metal stud backup walls.

3.7 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 8 inches, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend flashings to within 1/4 inch of exterior face of masonry.

C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

D. Install termination bar at top edge of flashings. Fasten termination bar at 6 inches on center.

3.8 LINTELS

A. Install loose steel lintels over openings.

3.9 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

D. Form expansion joint as detailed on drawings.

3.10 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

F. Maximum clear distance at pipe, conduit and other masonry penetrations: Clear distance at any point not to exceed 1/8 inch from the surface of the penetrating component, when measured at any point.

3.11 CUTTING AND FITTING

A. Cut and fit for pipes, conduit and other masonry penetrations. See 3.10, F of this section for allowable tolerances. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 2200

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Masonry Units.

B. Reinforcement and Anchorage.

C. Flashings.

D. Accessories.

1.02 RELATED SECTIONS

A. Section 04 0511 - Mortar and Masonry Grout.

B. Section 07 9200 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 REFERENCES

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2005.

B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.

C. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2005a.

D. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

E. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2006.

F. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2006.

G. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2005.

H. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2005a.

I. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2006.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Glazed Units: 50 of each type, size, and color combination.
   3. Extra Pre-Faced Units: 50 of each type, size, and color combination.

1.06 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.07 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar and accessories and structural backup in mock-up. Mock-up must include integration of cast stone elements.

B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Split face and smooth units as designated on exterior elevations and Finish Schedules.
   3. Thickness: As designate on Drawings.
   4. Special Shapes: Provide non-standard blocks configured for corners.
      a. Provide bullnose units for all "interior" outside corners.
   5. Load-Bearing Units: ASTM C90, normal weight.
      a. Exposed Faces: Manufacturer's standard color and texture.
      d. Substitutions: See Section 016000 - Product Requirements.
   6. Non-Loadbearing Units: ASTM C129.
      a. Hollow block, as indicated.

2.02 MORTAR AND GROUT MATERIALS

A. Mortar and grout: As specified in Section 04 0511.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.

2. Hohmann & Barnard, Inc: www.h-b.com.
3. Masonry Reinforcing Corporation of America: www.wirebond.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A 615 Grade 60 (420) deformed billet bars; galvanized.

C. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.04 FLASHINGS

A. Rubberized Asphalt Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D 1970; minimum 0.030 inch total thickness; with cross-linked polyethylene top and bottom surfaces.
   1. Manufacturers:
      a. Grace Construction Productswww.na.graceconstruction.com
         1. Product: Perm-A-Barrier Wall Flashing.
      b. Polyguard Products, Inc. www.polyguardproducts.com
         1. Product: Polyguard 400 Air and Moisture Barrier with preformed inside corners and end dams.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Lap Sealant: Butyl type as specified in Section 07 9200.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc: www.h-b.com.
      c. Masonry Reinforcing Corporation of America: www.wirebond.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding x by maximum lengths available.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc: www.h-b.com.
      c. Masonry Reinforcing Corporation of America: www.wirebond.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Drainage Devices: HDPE drainage device. Provide MORTAR NET, manufactured by Hohmann and Barnard.
   1. Substitutions permitted under provisions of Section 01 6000.

D. Stainless Steel Drip Plate: Provide “DP” stainless steel drip plate manufactured by Hohmann and Barnard at terminations of flashing.
   1. Substitutions permitted under provisions of Section 01 6000.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Standard Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners, except for units laid in stack bond.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

I. Isolate masonry partitions from vertical structural framing members with a control joint.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.06 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.

2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend plastic and laminated flashings to within 1/4 inch of exterior face of masonry.

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.07 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill in all block cavities without displacing reinforcing.

3.08 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joint in accordance with Section 07 9005 for sealant performance.

E. Form expansion joint as detailed.

3.09 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.10 TOLERANCES

A. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.11 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C 67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C 140 for conformance to requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.

3.13 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.14 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

END OF SECTION

SECTION 05 4000

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Load bearing formed steel stud exterior wall framing.

1.2 REFERENCES

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; current edition.

B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; current edition.

C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.

D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; current edition.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; current edition.

F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; current edition.

1.3 SYSTEM DESCRIPTION

A. Size components to withstand design loads in conformance with applicable codes.
   1. Refer to structural drawings for design wind loads.

B. Horizontal Deflection: Design to permit maximum deflection of 1/600 of span.

C. Vertical Deflection: Design non-axial loadbearing framing to accommodate not less than 3/8 in vertical deflection.

D. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

E. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   1. Design stud connections to withstand live load deflections of L/240 for primary building structural members.

1.4 SUBMITTALS

A. See Section 01 3000 – Administrative Requirements for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, including widths and gages of studs and joists, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud, floor joist, ceiling joist, roof joist, and roof rafter layout.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Provide calculations for loadings and stresses, stamped by a Professional Structural Engineer, licensed in the State of Texas.
   4. Provide details and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer licensed in the State of Texas.
   5. Provide keyed plans depicting stud gage and spacing for all walls, stamped by a Professional Structural Engineer licensed in the State of Texas.

E. Product data for thermal insulation strips.

F. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

B. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.

C. Installer: Company specializing in performing the work of this section with minimum five years of experience.

D. Design structural elements, spacing and sizing off all metal studs on interior and exterior of project under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

1.6 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

1.7 RECYCLED CONTENT

A. Provide products and accessories containing not less than 33 percent recycled content.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. Dietrich Metal Framing: www.dietrichindustries.com.
   2. Marino-Ware: www.marinoware.com.
   3. The Steel Network Inc: www.SteelNetwork.com.
   4. Telling Industries: www.tellingindustries.com.
   5. Substitutions: Refer to applicable Division 1 sections.

2.2 FRAMING MATERIALS

A. Studs and Track: ASTM C 955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and depth: As required to meet specified performance levels and design detail compatibility. Do not exceed stud widths indicated on drawings without architect approval.

2. Galvanized in accordance with ASTM A 653/A 653M G90/Z275 coating.

B. Framing Connectors: Factory-made formed steel sheet, ASTM A 653/A 653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
   1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 16 gage, 0.06 inch thickness.
   2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
   3. Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.3 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.4 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A 153/A 153M.
   1. Provide fasteners containing 100% recycled materials.

B. Anchorage Devices: Power actuated.

C. Welding: In conformance with AWS D1.1.

2.5 SHOP FABRICATED ASSEMBLIES

A. Shop fabricate metal framing to the greatest extent possible.

B. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing components are ready to receive work.

3.2 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

3.3 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/8 inch.

B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.3 QUALITY ASSURANCE

A. Design under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53, Grade B, black finish.

E. Bolts, Nuts, and Washers: ASTM A325, Type 1, galvanized to ASTMA153 where connecting galvanized components.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 1/2 x 2-1/2 inches members spaced at 20 inches.
   2. Rungs: 3/4 inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 5 inches from wall surface.

B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

C. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

D. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.4 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be imbeddedin masonry, and items exposed to the elements.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123 requirements.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preservative treated wood materials.

B. Fire retardant treated wood materials.

C. Miscellaneous framing and sheathing.

D. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS

A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; Current Edition.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; Current Edition.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; Current Edition.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; Current Edition.

E. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); Current Edition.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Douglas Fir-South, unless otherwise indicated.
2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.3 SHEET MATERIALS

A. Communications Room Mounting Boards: PS 1 A-C plywood A side out; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84; free of defects (knots and voids shall be considered a defect) to be installed covering all walls. The plywood shall be 4 feet by 8 feet and be installed 24 inches above finished floor. Plywood shall be mounted with the A side exposed to the interior of the room and the C side against the wall. Backboards shall be painted with Architect selected color, leaving the UL fire-rating symbol unpainted and visible.

B. Electrical Rooms: Do not install plywood panels in electrical rooms.

2.5 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere with 100% recycled content.
   2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete, recycled content 100%

2.6 FACTORY WOOD TREATMENT

A. All interior rough carpentry items are to be fire retardant treated.

B. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

C Fire Retardant Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
      b. Hoover Treated Wood Products, Inc: www.frtw.com.
      c. Osmose, Inc: www.osmose.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. All interior rough carpentry items are to be fire retardant treated.
c. Treat rough carpentry items as indicated .
d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

D. Preservative Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
b. Viance, LLC: www.treatedwood.com.
c. Osmose, Inc: www.osmose.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber in contact with roofing, flashing, or waterproofing.
c. Treat lumber in contact with masonry or concrete.
d. Treat lumber less than 18 inches above grade.
e. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fire blocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.4 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.5 INSTALLATION OF WOOD SHEATHING

A. Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws or staples.

3.6 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.7 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.8 CLEANING

A. Waste Disposal:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000

FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.2 SUBMITTALS

A. See Section 01 3000 – Administrative Requirements for submittal procedures.

B. Product Data.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade at clubhouse and Economy grade elsewhere.

B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum three years of documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

1.5 PROJECT CONDITIONS

A. Sequence the installation to ensure utility connections are achieved in an orderly and expeditious manner.

B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Softwood Lumber: Southern Pine species, plain sawn, maximum moisture content of 6percent; with vertical grain, of quality suitable for transparent finish.

B. Product made without formaldehyde and complying with ANSI A208.2 Grade MD.

2.2 SHEET MATERIALS

A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.

B. Softwood Plywood Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B; glue type as recommended for application.

C. Softwood Plywood: PS 1 Grade A-B; Veneer core; Southern Pine face species, plain sliced cut.

2.3 FASTENERS

A. Fasteners: Of size and type to suit application; brushed chrome finish in exposed locations.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
   1. VOC Limits for Installation Of Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Wood Glues: 30 g/L.
      b. Contact Adhesive: 250 g/L.

2.4 ACCESSORIES

A. Lumber for Shimming, Blocking: Softwood lumber of Southern Pine species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.5 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8-inch matching hardwood edging. Use one piece for full length only.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Back prime all edges.

2.6 FIELD FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. Paint work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Section 1500 and in accordance with Section 09 9000 Paints and Coatings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed andready to receive this work.

3.2 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic-laminate-faced fabricated casework.

B. Cabinet hardware.

C. Factory finishing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
   2. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification: Provide AWI Quality Certification Program inspection report and quality certification of completed work.
   1. Provide labels or certificates indicating that the work complies with requirements of AWS Grade or Grades specified.
   2. Prior to delivery to the site provide shop drawings with certification labels.
   3. Provide labels on each product when required by certification program.
   4. Upon completion of installation provide certificate certifying that the installation and products meet the specified requirements.
   5. Arrange and pay for inspections required for certification.
   6. Replace, repair, or rework all work for which certification is refused.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.6 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Premium Grade.

B. Plastic Laminate Faced Cabinets: Custom grade, full overlay, MDF construction, laminate manufacturer and finish as shown in 'Room Finish Key' on Drawings.
   1. Concealed Surfaces: Melamine.

2.2 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.3 LAMINATE MATERIALS

A. Manufacturers:
   1. Basis of Design: Formica Group: www.formica.com
   2. Wilsonart Engineered Surfaces; www.wilsonart.com.
   3. Mannington Mills: www.mannington.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as follows:
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.

D. Colors: As designated in "Interior Finish Schedule" on Drawings.

2.4 COUNTERTOPS

A. See Section 12 3600.

2.5 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.6 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated shelf rests, polished chrome finish.

C. Drawer and Door Pulls: Hafele 2” anodized aluminum tab pulls. 6” pulls in vertical orientation at corridor 104 cabinets.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

E. Provide clear 3M bumpons on all cabinet doors.

F. Grommets: Flush mounted, aluminum, matte black with hold-down clip.

G. Drawer Slides:
1. Type: Full extension.
2. Static Load Capacity: 100 lbs.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self-closing/stay-closed type.
6. Manufacturers:
   a. Accuride International, Inc : www.accuride.com.
   b. Hettich America, LP : www.hettichamerica.com.
   c. Knape & Vogt Manufacturing Company : www.knapeandvogt.com.
   d. Substitutions: See Section 016000 - Product Requirements.

H. Hinges: Institutional five-knuckle semi-concealed type.
1. Manufacturers:
   a. Hardware Resources : www.hardwareresources.com.
   b. Hettich America, LP : www.hettichamerica.com.
   c. Julius Blum, Inc : www.blum.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.7 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.8 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood, finish flush with surrounding surfaces.

3.3 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 070553

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Paint finish.

1.2 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Partition Identification Labels:
   1. Fire Wall Signs, Inc: www.firewallsigns.com/#sle.
   2. Safety Supply Warehouse, Inc: www.safetysupplywarehouse.com/#sle.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.

D. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

A. See Section 09 9123 for substrate preparation for painted markings.

3.3 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 099123.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt insulation in interior wall and ceiling construction.

B. Batt insulation for exterior wall construction.

C. Continuous insulation for exterior wall construction.

D. Insulation for roof system.

1.2 REFERENCE STANDARDS

A. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation, 2019

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

E. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.4 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.4 PERFORMANCE REQUIREMENTS

A. Roof Insulation
   1. Above Deck: R-25Ci
   2. Metal Building: R-19 +R-11 LS.

B. Wall Insulation
   1. Metal Building: R 13 +R6.5Ci
   2. Metal Frame: R-13 +R-5Ci.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board, or mineral wool.

B. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.2 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Thickness: As required to achieve the performance ratings in paragraph 1.4.
   5. Facing: Asphalt treated mesh reinforced Kraft paper, one side.

C. Manufacturers:
   a. CertainTeed Corporation: www.certainteed.com.
   b. Johns Manville: www.jm.com.
   c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.3 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Complies with ASTM C578, and manufactured using carbon black technology.
   1. Type and Compressive Resistance: Type IV, 25 psi, minimum.
   2. Flame Spread Index (FSI): Class A 0 to 25 when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 minimum, per 1 inch thickness at 75 degrees F mean temperature.
   5. Complies with fire resistance requirements indicated on Drawings as part of an exterior non-load-bearing exterior wall assembly when tested in in accordance with NFPA 285.
   6. Board Size: 48 inch by 96 inch.
   7. Board Thickness: As required to achieve the performance ratings in paragraph 1.4.
   8. Board Edges: Square.
   9. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
   10. Products:
      a. DuPont de Nemours, Inc; Styrofoam Brand Ultra SL (Shiplap)

2.4 ACCESSORIES

A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.4 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane.

B. Seam Tape.

C. Flashing.

D. Fasteners.

1.2 REFERENCES

A. ASTM International
   1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193; Standard Guide for Use of Joint Sealants
   3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
   4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
   5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E96; Test Method for Water Vapor Transmission of Materials
   7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
   8. ASTM E2178; Test Method for Air Permeance of Building Materials
   9. ASTM E2357; Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

B. AATCC – American Association of Textile Chemists and Colorists
   1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. TAPPI
   1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
   2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

A. See Division 1 sections for submittal procedures.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Quality Assurance Submittals
   1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
   3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

D. Closeout Submittals
   1. See Division 1 sections for close-out procedures..
   2. Weather Barrier Warranty: Manufacturer's executed 10 Year Limited Product and Labor Warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Installer shall have experience with installation of commercial weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
   3. Source Limitations: Provide commercial weather barrier and accessory materials produced by single manufacturer.

B. Mock-up
   1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
      a. Mock-up size: 10 feet by 10 feet.
      b. Mock-up Substrate: Match wall assembly construction, including window opening.
      c. Mock-up may remain as part of the work following approval.
   2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting
   1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
   2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.7 WARRANTY

A. Special weather-barrier manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase.

B. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty are required.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURER

A. DuPont; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1-800-44-TYVEK (8-9835); http://www.construction.tyvek.com

B. See Division 1 sections for substitution procedures.

2.2 MATERIALS

A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.

B. Performance Characteristics:
   1. Air Penetration: 0.001 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E2357
   2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.

3. Water Penetration Resistance: 280 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 2.7 oz/yd2, when tested in accordance with TAPPI Test Method T-410.
5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 10, Smoke Developed: 10.

2.3 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape for commercial applications.

B. Fasteners:
   1. DuPont™ Tyvek® Wrap Cap Screws, as distributed by DuPont: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4” or 2” metal gasketed washer

C. Sealants
   1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
   2. Products:
      a. Sealants recommended by the weather barrier manufacturer.

D. Adhesives:
   1. Provide adhesive recommended by weather barrier manufacturer.

E. Primers:
   1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

F. Flashing
   1. DuPont™ FlexWrap™, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.
   2. DuPont™ StraightFlash™, as distributed by DuPont: straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.
   3. DuPont™ StraightFlash™ VF, as distributed by DuPont: dual-sided straight flashing membrane materials for brick mold and non-flanged windows and doors.
   4. DuPont™ Thru-Wall Surface Adhered Membrane with Integrated Drip Edge: Thru-Wall flashing membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.) and at transitions between different assembly materials.
   5. Preformed Inside and Outside Corners and End Dams as distributed by DuPont: Preformed three-dimensional shapes to complete the flashing system used in conjunction with DuPont™ Thru-Wall Flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install weather barrier prior to installation of windows and doors.

C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier
   1. Exterior corners: minimum 12 inches.
   2. Seams: minimum 6 inches.

H. Weather Barrier Attachment:
   1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

I. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows – all cladding types)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows – all cladding types)

A. Cut 7-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start DuPont™ StraightFlash™ at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ DuPont™ FlexWrap™ NF at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer’s instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C 1193.

3.6 OPENING PREPARATION (for use with flanged windows)

A. Cut weather barrier in an "I-cut" pattern.
   1. Cut weather barrier horizontally along the bottom and top of the window opening.
   2. From the top center of the window opening, cut weather barrier vertically down to the sill.
   3. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

A. Cut 7-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations.

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 THRU-WALL FLASHING INSTALLATION

A. Apply primer per manufacturer's written instructions.

B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.

C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.

D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.

E. Roll flashing into place. Ensure continuous and direct contact with substrate.

F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.

G. Terminate membrane on vertical wall. Terminate into reglet, counterflashing or with termination bar.

H. Apply sealant bead at each termination.

3.9 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL

A. Overlap thru-wall flashing with weather barrier by 6-inches.

B. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.

C. Seal vertical and horizontal seams with tape or sealing membrane.

3.10 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE

A. Seal weather barrier to bottom of shelf angle with sealing membrane.

B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.

C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.

3.11 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD

A. Cut flap in weather barrier at window head.

B. Prime exposed sheathing.

C. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.

D. Install end dams bedded in sealant.

E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.

F. Apply sealant along thru-wall flashing edges.

G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.

H. Tape diagonal cuts of weather barrier.

I. Secure weather barrier flap with fasteners.

3.12 FIELD QUALITY CONTROL

A. Notify manufacturer’s designated representative to obtain required periodic observations of weather barrier assembly installation.

3.13 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 4113

METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels installed over existing roofing.

B. Thermal roof insulation.

C. Attachment system.

D. Finishes.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Rigid roof insulation.

B. Section 07 9200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2012.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, curbs, gutters, downspouts, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.
   2. Include typical fastening detail.

F. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.

G. Test Reports: Indicate compliance of metal roofing system to specified requirements.

H. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
   1. Accredited by IAS in accordance with IAS AC472.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of twenty years from Date of Substantial Completion.

C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

B. Metal Roof Panels:
   1. McElroy Metals; 238T T Metal-over-Metal Roof Recover System; www.mcelroymetal.com/retrofit-and-recover/238T-metal-over-metal.
   2. Substitutions: See Section 016000 - Product Requirements.

2.2 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
      b. Steel Thickness: Minimum 24 gage (0.024 inch).
   2. Profile: Standing seam.
   3. Texture: Smooth.
   4. Length: Full length of roof slope, without lapped horizontal joints.
   5. Width: Maximum panel coverage of 16 inches.
   6. Mill-Finish Steel Panels: Treat with passivating chemical prior to shipment, to inhibit formation of corrosion.

2.3 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.4 SECONDARY FRAMING

B. Miscellaneous Secondary Framing: Light gage steel framing incidental to structural supports; fabricated from steel sheet.

C. Framing Material: ASTM A 1011/A 1011M, Designation SS steel sheet.
   1. Profile: Manufacturer's standard cee, zee, asymmetrical zee, hat channel, plain channel, single slope eave strut, double slope eave strut, and angle.
   2. Thickness: 12 gage, 0.1046 inch.
   3. Finish: Galvanized per ASTM A653/A653M, G90.

D. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.

2.5 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.6 FINISHES

A. Prefinished metal shall be Aluminum-Zinc Alloy Coated (AZ-50 Galvalume®) Steel Sheet, 24-Gauge or 22-Gauge*, ASTM 792, Grade 40, yield strength 40 ksi min. or 3105 Alloy Aluminum Sheet 0.032 or 0.040*, ASTM B209, H14 temper, yield strength 21 ksi min.

B. Finish shall be full strength Kynar 500® or Hylar 5000® fluoropolymer coating applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil over 0.20 ± 0.05 mil prime coat, to provide a total top side dry film thickness of 0.95 ± 0.10 mil. Bottom side shall be coated with a primer (non-metallics only) and beige urethane coating with a total dry film thickness of 0.35 ± 0.05 mil. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by the Kynar 500® or Hylar 5000® finish supplier.
   1. Color: As selected from manufacturer's full line of "Standard Colors" or Acrylic-Coated Galvalume.

C. Strippable film shall be applied to the top side of all prefinished metal to protect the finish during fabrication, shipping and field handling. This strippable film MUST be removed immediately before installation.

D. Unpainted metal shall be Aluminum-Zinc Alloy Coated (AZ-55 Acrylic Coated Galvalume®) Steel Sheet, 24-Gauge or 22-Gauge*, ASTM 792, Grade 40, yield strength 40 ksi min., with clear acrylic coating on both sides of material.

E. Field protection must be provided by the contractor at the job site so stacked or coiled material is not exposed to weather and moisture.

F. Flashing may be factory fabricated or field fabricated. Unless otherwise specified, all exposed adjacent flashing shall be of the same material and finish as panel system

2.7 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
   3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Thermal Insulation: Provide flexible blanket, rigid, or semi-rigid type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame spread index of 50, per ASTM E84; for installation using spacer blocks.
   1. Thermal Resistance: Minimum, R-value of 9.4.

E. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
   1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   3. Fasteners: As specified by manufacturer and building code qualification report or approval.
   4. Manufacturers:
      a. System Components Corporation, Inc; FelTex: www.systemcomponents.net/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Broom clean existing surface prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Separate dissimilar metals by applying a bituminous coating, high temperature, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
   3. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

D. Insulation: Install insulation between roof covering and supporting members to present a neat appearance. Fold, staple, and tape seams unless otherwise approved by Architect.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, interior liner panels, soffit panels, and subgirt framing assembly, related flashings, and accessory components.

1.2 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Water-resistive barrier under wall panels.

B. Section 07 9005 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.3 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2021a.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.6 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Construct mock-up, 10 feet x 10 feet; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, and related insulation in mock-up.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.8 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners:
   1. Basis of Design: MBCI “Perma-Clad”.
   2. Substitutions: Under provisions of Section 01 6000.

2.2 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels, interior liner panels, soffit panels, and subgirt framing assembly.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with applicable codes.
   4. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   8. Corners: Factory-fabricated in one continuous piece with minimum 2-inch (51 mm) returns.

B. Exterior Wall Panels:

1. Profile: Vertical; style as indicated.
2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
3. Panel Width: 36 inches.
4. Thickness: 29 gauge.
5. Color: As designated in Finish Schedule on Drawings.

C. Soffit Panels:
1. Profile: Style as indicated, with venting provided.

D. Subgirt Framing Assembly:
1. 16 gauge, 0.0598 inch thick formed non-precoated steel sheet.

E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

F. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.

G. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

H. Anchors: Galvanized steel.

2.3 MATERIALS

A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.4 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

2.5 ACCESSORIES

A. Cladding Support Clips: Thermally-broken, thermal spacer clips for support of cladding z-girts, angles, channels, and other framing.
1. Thermal Spacer Clip: Pultruded glass fiber and thermoset polyester resin clip; 3/16 inch thick at top, base, and web.
2. Clip Depth: As indicated on drawings.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9205

C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that water-resistive barrier, see Section 07 2500, has been properly installed over substrate; see Section 05 4000.

3.2 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane and spaced at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Provide expansion and control joints where indicated.

3.4 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

3.5 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 4646

FIBER CEMENT SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood-fiber cement siding, soffits, and trim.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.1 PRODUCTS

A. Acceptable Manufacturers:
   1. James Hardie Building Products, Inc: www.jameshardie.com.
   2. Substitutions: In accordance with Section 01 6000 Product Requirements.

B. Fiber Reinforced Cement Sheet Siding: Cement fiber reinforced lap siding, finish as selected by Architect; 4 x 8 x 5/16 inch thick; having the following ASTM E 84 fire test performance: Flame Spread 0, Fuel Contribution 0, Smoke Development 5.
   1. Acceptable Products:
      a. Hardipanel by James Hardie Building Products.
      b. Substitutions: In accordance with Section 01 6000 Product Requirements.

C. Fiber Reinforced Cement Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C 1186 Type A Grade II; with machined edges, for nail attachment.
   1. Texture: Simulated cedar grain.
   2. Length: 96 inches, nominal.
   3. Width: 48 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish: Factory applied primer.
   6. Manufacturer: Same as siding.
   7. Perforations: Manufacturer’s standard for attic ventilation.

2.2 ACCESSORIES

A. Trim: Same material and texture as siding and soffit, 5/4 inch thickness
   1. Acceptable Product: Harditrim by James Hardie Building Products.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

C. Joint Sealer: As specified in Section 07 9000.

D. Finish Paint: See Section 09 9000.

E. Furring Strips For Use Behind Sheet Siding: 3/8 inch thick x 1-1/2 inch wide polypropylene furring strips, attached vertically over air/moisture barrier at face of each supporting stud, to create capillary break between face of air/moisture barrier and back of siding, equal to Cor-A-Vent Sturdi-Strip with SV-3 continuous at top and bottom, by Cor-A-Vent Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Install sheet metal flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with all terms necessary to maintain warranty coverage.
   2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
   3. Use trim details indicated on drawings.
   4. Touch up all field-cut edges before installing.
   5. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Gypsum or Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.

D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

E. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

F. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

G. Finish Painting: Specified in Section 09 9000.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, coping, sheet metal roofing, and prefinished break metal.

B. Sealants for joints within sheet metal fabrications.

C. Reglets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 4113 – Metal Roof Panels: Flashing used in roofing patching and repair.

B. Section 07 7100 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

C. Section 07 7123 – Manufactured Gutters and Downspouts: Gutters and downspouts.

1.3 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Division 1 sections for submittal procedures

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 12x12x inch in size illustrating metal finish color.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.8 WARRANTY

A. Provide Owner with a written warranty which warrants sheet metal work to be free of leaks and defects in materials and workmanship for 5 years after date of Substantial Completion.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A635M, with G90/Z275 zinc coating , minimum 24 gage thick base metal. Furnish ARMCO Zincgrip Paintgrip at items indicated to be field painted. Thickness: As indicated on Drawings. Zincgrip to be painted where visible.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system, color as selected by Architect.

C. Stainless Steel: ASTM A666, Type 304, soft temper, 28 gage (0.0156 inch) thick; smooth No. 4 finish.

D. Refer to drawings for locations of sheet metal types.

2.2 ACCESSORIES

A. Fasteners: Match metal type being fastened, with soft neoprene washers.
   1. Nails: Flathead, wire, barbed, slating type.
   2. Screws: Stainless steel, self-tapping sheet metal type, heads color matched to metal roof.
   3. Rivets: Type and size as recommended by sheet metal manufacturer.
   4. Concrete Fasteners: Round-head stainless steel screw and neoprene washer with lead expansion anchor, FS FF-S-325, Group IV, Type 2. Power Rawl Screw Type Nailins.

B. Underlayment: Rubberized, self-adhering.

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

F. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

G. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.

H. Plastic Cement: ASTM D4586, Type I.

I. Solder: ASTM B32, Sn50 (50/50 tin/lead) type.

J. Rubberized Underlayment: Self-adhering, polyethylene coated high temperature rubberized asphalt, minimum 30 mil. Thick, Vycor Ultra by W. R. Grace and Co. or WIP 3600HT by Mirafi, for high temperature applications.

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet material to be fastened, minimum 3 inches wide, interlocking with sheet. Cleats to be 2 gauges heavier than material secured.

C. Make angle ends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.

D. Form pieces in longest possible lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Form material with scheduled or specified seams. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

G. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

H. Fabricate vertical faces with bottom edge formed outward 3/4 inch with 5/8-inch return, and hemmed to form drip at 30 degrees angle with vertical.

2.4 FABRICATED ITEMS

A. Flashings, Counterflashings and Misc: Galvanized sheet steel as scheduled, formed in minimum 10 ft lengths where possible, detailed as indicated.

B. Continuous Cleats: Minimum 1-1/4-inch continuous strips, same material and thickness as adjacent sheet steel metal item, except where heavier gage is noted on detail drawings.

C. Conductor Head, Gutters, Downspouts, Ridge Cap, Rake Edge Flashing: Gage, profile and materials as indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

C. Verify that substrates are smooth and clean to extent needed for sheet metal work.

D. Do not start sheet metal work until conditions are satisfactory.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION - GENERAL

A. Conform to drawing details and requirements of SMACNA – Architectural Sheet Metal Manual.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Conceal flashings to the extent possible, while maintaining specified drainage.

E. Solder metal joints in galvanized steel items for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

3.4 INSTALLATION – FABRICATED ITEMS

A. Flashings, Counter Flashings
   1. Extend flanges place and securely fasten.
   2. Where fastening is required, fasten at 6 inches o. c.
   3. Overlap counter flashing 4 inches over base flashing, lap ends of sheets 3 inches.

B. Conductor Heads:
   1. Prefinished sheet steel, formed in minimum construction material is 24 gage galvanized steel.
   2. Conductor heads should be installed according to methods outlined in Figures 1-26, 1-27, and 1-*28 per MNACA requirements.
   3. Face Width: 3 to 4 times downspouts width.
   4. Face Depth: 2 times downspout width.
   5. Height: 3 to 4 times downspout width.

C. Downspouts: Prefinished sheet steel, upper sections telescoped into lower sections 1-1/2 inch, riveted and sealed.
   1. Fabricate downspouts with elbows discharging onto splash pans or splash blocks.

D. Fascia:
   1. Prefinished sheet steel, formed in minimum 10 ft lengths to profiles as detailed, similar to SMACNA Figures 8-9 and 8-10.
   2. Provide concealed back-up plate at joints.
   3. Provide mitered corners, sealed.

3.3 CLEANING

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

END OF SECTION

SECTION 07 7100

ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured roof specialties, including fascias, and vents.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; current edition.

B. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; current edition.

C. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; current edition, with interim updates.

D. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; Single Ply Roofing Industry; current edition

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with NRCA ML104 details.
   1. Maintain one copy on project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Pipe and Penetration Flashings:
   1. Portals Plus by Commercial Products Group of Hart and Cooley, Inc.; None - N/A: www.portalsplus.com.
   2. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

2.2 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane;
   2. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable code.
   3. Material: Formed steel sheet, galvanized, 24 gage, 0.024 inch thick, minimum.
   4. Finish: 70 percent polyvinylidene fluoride.
   5. Color: To be selected by Architect from manufacturer's standard range.

B. Roofing Vents: Formed aluminum of watertight construction to permit construction below roof membrane to breathe; with attachment flanges.
   1. Finish: Mill finish.

2.3 ACCESSORIES

A. Roof Cement: ASTM D4586, Type I.

2.4 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Conform to NRCA ML104 drawing details as noted:

C. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

D. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

B. Precast concrete splash pads.

1.2 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim.

1.3 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

D. Samples: Submit two samples, 24 inch long illustrating component design, finish, color, and configuration.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Cheney Flashing Company: www.cheneyflashing.com/#sle.
   3. Drexel Metals Inc: www.drexmet.com/#sle.
   4. OMG Roofing Products: www.omgroofing.com/#sle.

5. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc: www.saf.com/persys/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
   1. Finish: Shop pre-coated with PVDF (polyvinylidene fluoride) coating.
   2. Color: As selected from manufacturer's standard colors.

B. Protective Backing Paint: Zinc molybdate alkyd.

2.3 COMPONENTS

A. Gutters: SMACNA rectangular style profile.

B. Downspouts: SMACNA Rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: 1” x 1/8” straps wrapped in 24 gage prefinished metal, 36” on center..
   3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.4 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.5 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints at 50 feet on center.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

F. Lap joints in gutter 2-inches. Install silicone sealant continuous in lap, and install 2 rows of rivets spaced 1-inch on center, with the rows staggered.

G. Secure downspouts plumb and level, with straps at to and bottom, and at 10’ on center, at joints in downspoout.

2.6 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Set splash blocks under downspouts.

END OF SECTION

SECTION 07 7200

ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured curbs, equipment rails, and pedestals.

1.2 SUBMITTALS

A. See Section 01 3000 Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.1 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
   1. AES Manufacturing Inc.: www.aescurb.com.
   2. The Pate Company: www.patecurbs.com.
   3. Roof Products & Systems (RPS) by Commercial Products Group of Hart & Cooley, Inc : www.rpscurbs.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gage, 0.048 inch thick.

C. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.

D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.

2.2 NON-PENETRATING ROOFTOP ASSEMBLIES

A. Non-Penetrating Rooftop Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly.
   1. Design Loadings and Configurations: As required by applicable codes.
   2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
   3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.

C. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install curbs and other accessories in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

3.4 CLEANING

A. Clean installed work to like-new condition.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Qualification statements for installing mechanics.

1.3 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:
      a. With minimum 3 years documented experience installing work of this type.
      b. Able to show at least 5 satisfactorily completed projects of comparable size and type.
      c. Licensed by authority having jurisdiction.

1.4 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.

B. If accepted, mock-up will represent minimum standard for the Work.

C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.5 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 FIRESTOPPING - GENERAL REQUIREMENTS

A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.2 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

2.3 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

C. Foam Firestoppping: Single component silicone foam compound.
   1. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti, Inc: www.us.hilti.com.
      c. Specified Technologies, Inc: www.stifirestop.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers.
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. USG: www.usg.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening.
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. Pecora Corporation: www.pecora.com.
      c. Thermafiber, Inc: www.thermafiber.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed.
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

G. Intumescent Putty: Compound that expands on exposure to surface heat gain.
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

H. Reusable Firestopping: Removable intumescent compressible shapes, pillows, or blocks specifically tested in removable configuration.
   1. Manufacturers:
      a. RectorSeal: www.rectorseal.com.
      b. Hilti, Inc: www.us.hilti.com.
      c. Nelson FireStop Products: www.nelsonfirestop.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

I. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Hollow gaskets.

1.2 REFERENCES

A. ASTM C 834 - Standard Specification for Latex Sealants; current edition.

B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; current edition.

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; current edition.

D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; current edition.

E. ASTM D 1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; current edition.

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.4 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years experience.

D. General Contractor is to arrange for manufacturer inspection to generate field report documenting acceptable practices for this scope of work. Generated field report to be posted on web based file sharing system.

E. Joint sealer to be applied to all dissimilar materials whether indicated on drawings or not. Colors must be submitted and approved as a mock up prior to commencement of Work.

1.5 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with exterior masonry mock-ups.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.7 COORDINATION

A. Coordinate the work with all sections referencing this section.

B. Mock-ups must be complete for review and approval. Only after complete mock-up has been approved may Work commence.

1.8 WARRANTY

A. Correct defective work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

A. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component.
   1. Color: Standard colors matching finished surfaces.
   2. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.

B. Medium Modulus Silicone
   1. Color: To match finished surface.
   2.`Application: Metal panels to windows and doors, and louver perimeters:

C. Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent;
   1. Color: Selected from standard range by Architect.
   2. Size as required to provide weathertight seal when installed.
   3. Applications: Use for:
      a. Exterior wall expansion joints.

D. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Concealed sealant bead in siding overlaps.

E. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
   1. Color: Standard colors matching finished surfaces as approved by Architect.

2. Applications: Use for:
   a. Interior wall and ceiling control joints.
   b. Joints between door and window frames and wall surfaces.
   c. Other interior joints for which no other type of sealant is indicated.

F. Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant. Color to be selected by Architect.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

G. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
   1. Applications: Use for concealed locations only:
      a. Sealant bead between top stud runner and structure and between bottom stud track and floor, when indicated on drawings.

G. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
   1. Approved by manufacturer for wide joints up to 1-1/2 inches.
   2. Color: Standard colors matching finished surfaces approved by Architect.
   3. Applications: Use for:
      a. Expansion joints in floors.

I. Concrete Paving Joint Sealant: Polyurethane, non-sag; ASTM C 920, Class 25, Uses T, I, M and A; two-component.
   1. Color: Gray.
   2. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

J. Sealant Joint Schedule: Refer to Drawings – Sealant Joint Schedule, for additional information and procedures.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Closed cell round foam rod compatible with sealant; ASTM D 1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Grind porous substrates.

D. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

E. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C 1193.

C. Perform acoustical sealant application work in accordance with ASTM C 919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface. Seal edges with sealant.

J. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface. Seal edges with sealant.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 08 Section "Access Control Hardware".
7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
8. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.
9. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.

3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. CECO Door Products (C) Honeycomb Core - Regent Series.
2. CECO Door Products (C) Polystyrene Core - Legion Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

    a. CECO Door Products (C) - SU SR Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

a. CECO Door Products (C) - BU DU Series.
b. CECO Door Products (C) - SU Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

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SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

C. Fire-rated steel doors and frames.

D. Impact-resistant exterior doors.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Doors and Frames:
   1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
   2. Republic Doors: www.republicdoor.com.
   3. Steelcraft: www.steelcraft.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.

3. Door Edge Profile: Beveled on both edges.
4. Door Texture: Smooth faces.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
8. Finish: Factory primed, for field finishing.
9. Glazing for exterior doors to be impact-resistant.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 STEEL DOORS

A. Exterior Doors :
1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
2. Core: Polystyrene foam.
3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
4. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
5. Weatherstripping: Separate, see Section 08 7100.

B. Interior Doors , Non-Fire-Rated:
1. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 1, full flush.
2. Core: Cardboard honeycomb.
3. Thickness: 1-3/4 inches.

C. Interior Doors , Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.
2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
   a. Provide units listed and labeled by UL.
   b. Attach fire rating label to each fire rated unit.
3. Core: Mineral fiberboard.

D. Interior Smoke and Draft Control Doors : Same construction as fire-rated doors with indicated fire rating, plus:
1. Gasketing: No added gasketing or seals allowed.
2. Label: UL "S" label.

2.4 STEEL FRAMES

A. General:
1. Comply with the requirements of grade specified for corresponding door, except:

a. ANSI A250.8 Level 1 Doors: 16 gage frames.
b. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage

2. Finish: Same as for door.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
5. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

B. Exterior Door Frames: Face welded, seamless with joints filled.
1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
2. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames, Non-Fire-Rated: Face welded, seamless with joints filled.

D. Interior Door Frames, Fire-Rated:Face welded, seamless with joints filled .
1. Fire Rating: Same as door, labeled.

2.5 ACCESSORY MATERIALS

A. Louvers: Roll formed steel with overlapping frame; ; factory-installed.
1. In Fire-Rated Doors: UL-listed fusible link louver, same rating as door.

B. Glazing: As specified in Section 08 8000, factory installed, impact resistant.

C. Astragals for Double Doors: Specified in Section 08 7100.
1. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

D. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.6 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware items.

3.4 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 1416

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated, non-rated.

1.2 REFERENCE STANDARDS

A. ASTM E413 - Classification for Rating Sound Insulation; current edition.

B. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; current edition.

C. AWI (QCP) - Quality Certification Program, www.awiqcp.org; current edition at www.awiqcp.org.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; current edition.

E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; current edition.

G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; current edition.

H. The Forest Stewardship Council; www.fscus.org

I. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; current edition.

J. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

K. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

L. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
   2. Include certification program label.

C. Specimen warranty.

D. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

E. Samples: Submit three samples of door construction, 12 x 12 inch in size cut from top corner of door.

F. Samples: Submit three samples of door veneer, 24 x 24 inch in size illustrating wood grain, stain color, and sheen.

G. Certifications: Provide wood products containing certification and label of the Forest Stewardship Council.

H. Manufacturer's Installation Instructions: Indicate special installation instructions.

I. Warranty, executed in Owner's name.

1.4 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Quality Certification: Provide AWI Quality Certification Program inspection report and quality certification of completed work.
   1. Provide labels or certificates indicating that the work complies with requirements of AWS Grade or Grades specified.
   2. Prior to delivery to the site provide shop drawings with certification labels.
   3. Provide labels on each product when required by certification program.
   4. Upon completion of installation provide certificate certifying that the installation and products meet the specified requirements.
   5. Arrange and pay for inspections required for certification.
   6. Replace, repair, or rework all work for which certification is refused.

D. Installed Fire Rated Door: Conform to NFPA 80 for fire rated class as indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.6 WARRANTY

A. Interior Doors: Provide manufacturer's warranty for the life of the installation.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. High Pressure Decorative Laminate Faced Doors:
   1. Ampco Products, Inc: www.ampco.com.
   2. VT Industries, Inc: www.vtindustries.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 DOORS

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. High pressure decorative laminate facing .050" (GP50): NEMA LD 3, HGS; color as selected; finish as selected .

B. All Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at all locations.

C. Sliding Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at all locations .
   2. High pressure decorative laminate facing .050" (GP50): NEMA LD 3, HGS; color as selected; finish as selected.

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type – Particleboard Core (PC), plies and faces as indicated.

2.4 DOOR FACINGS

A. High Pressure Decorative Laminate Facing .050" (GP50) for Non-Fire-Rated Doors: NEMA LD 3, HGS; color as selected; finish as selected.

2.5 ACCESSORIES

A. Glazing Stops: Aluminum channel shape, mitered corners; prepared for countersink style tamper proof screws.

B. Metal Louvers:
   1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.
   2. Louver Blade: Inverted V blade, sight proof, light proof

C. Astragals for Non-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge.

D. Fill, sand and match finish of all nail holes.

2.6 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Fit door edge trim to edge of stiles after applying veneer facing.

E. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

H. Provide edge clearances in accordance with the quality standard specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not factory cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.3 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall access door and frame units.

B. Ceiling access door and frame units.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

D. Project Record Documents: Record actual locations of all access units.

PART 2 PRODUCTS

2.1 WALL AND CEILING UNITS

A. Manufacturers:
   1. Acudor Products Inc : www.acudor.com.
   2. Karp Associates, Inc : www.karpinc.com.
   3. Milcor by Commercial Products Group of Hart & Cooley, Inc : www.milcorinc.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
   1. Material: Steel.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames and flanges: 0.058 inch steel.
   4. Door panels: 0.070 inch single thickness steel sheet.
   5. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
      a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
      b. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.
   6. Steel Finish: Primed.
   7. Primed Finish: Polyester powder coat; manufacturer's standard color.
   8. Size(s): As indicated.
   9. Hardware:
      a. Hardware for Fire Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      c. Hinge: Non-Fire-Rated Units: 175 degree steel hinges with removable pin.
      d. Latch/Lock: Screw driver slot for quarter turn cam latch.

10. Galvanized, hot dipped finish.
11. Stainless steel at wet locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Infill panels of glass.

C. Aluminum doors and frames.

D. Weatherstripping.

E. Door hardware.

F. Perimeter sealant.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Provide Engineered, sealed shop drawings indicating system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.6 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Oldcastle Building Envelope: www.oldcastlebe.com.
   2. Kawneer North America: www.kawneer.com.
   3. United States Aluminum Corp: www.usalum.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Glazing Position: Center-set.
   3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   4. Water Leakage Test Pressure Differential: 2.86 lbf/sq ft.
   5. Air Infiltration Test Pressure Differential: 1.57 psf.
   6. Basis of Design: Oldcastle.

B. Performance Requirements:
   1. Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   3. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at specified differential pressure across assembly in accordance with ASTM E283.

4. Condensation Resistance Factor: Measure in accordance with AAMA 1503 with 1 inch insulating glass installed.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

2.3 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections , thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
   4. Subsills: Provide manufacturer's standard subsills for all storefront framing.

B. Doors: Glazed aluminum, heavy duty (1/8-inch wall thickness; with fully welded internal joints).
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 4 inches wide.
   3. Vertical Stiles: 4-1/2 inches wide.
   4. Bottom Rail: 10 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Concealed Flashings: 0.018 inch thick galvanized steel.

D. Perimeter Sealant: Type S-GP specified in Section 07 9005.

E. Glass: As specified in Section 08 8000.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

G. Glazing Accessories: As specified in Section 08 8000.

H. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

I.

2.5 FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As selected by Architect.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.6 HARDWARE

A. Door Hardware: Refer Drawings.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline , and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware .

G. Reinforce framing members for imposed loads.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form watertight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Fill shim spaces with low rise urethane foam sealant at perimeter of assembly to maintain continuity of thermal barrier.

J. Set thresholds in bed of mastic and secure.

K. Install hardware using templates provided.

L. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3.5 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION

A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 08 5113

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum windows, fixed.

B. Factory glazing.

1.2 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough opening framing.

B. Section 061000 - Rough Carpentry: Wood perimeter shims.

C. Section 072500 - Weather Barriers: Sealing frame to weather barrier installed on adjacent construction.

D. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 084313 - Aluminum-Framed Storefronts: Operable sash within framing system.

F. Section 088000 - Glazing.

1.3 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

E. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

F. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Grade Substantiation: Provide specified Grade Substantiation before submitting shop drawings or starting fabrication.

D. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

E. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner

construction, accessories, and finishes.

F. Submit two samples of operating hardware.

G. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

H. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

I. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

J. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

K. Manufacturer's Qualification Statement.

L. Installer's Qualification Statement.

M. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or

flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aluminum Windows:
   1. Basis of Design: EFCO, a Pella Company; Product Series 6600 Thermal Fixed F-AW80.
   2. Other Acceptable Manufacturers:
      a. Kawneer; www.kawneer.us
      b. Arcadia Inc.; www.arcadia.com

2.2 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with related flashings and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch.
   2. Operable Units: Double weatherstripped.
   3. Provide units factory glazed.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   6. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Performance Requirements: Provide products that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
      a. Performance Class (PC): R.

2.3 COMPONENTS

A. General
   1. All aluminum frame and vent extrusions shall have a minimum wall thickness of .080” (2 mm). Frame sill members shall have a minimum wall thickness of .094” (2.3 mm).
   2. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers.
   3. Depth of frame shall not be less than 3 7/8” (98 mm).

B. Frame
   1. Frame components shall be mechanically fastened.

C. Sash

1. All sash extrusions shall have a minimum wall thickness of .080” (2 mm).
2. All horizontal sash extrusions shall be tubular.
3. Corner connections shall be mechanically fastened.

D. Glazing: As specified in Section 088000.

E. Fasteners: Stainless steel.

F. Glazing Materials: As specified in Section 088000.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

H. Sealant and Backing Materials: As specified in Section 079005.

2.4 MATERIALS

A. Aluminum
1. Extruded aluminum shall be 6063-T6 alloy and tempered.

B. Glass

C. Window manufacturer to furnish and install Sealed Insulated - Low "E" glazing units in compliance with ASTM E-744. U-Factor lower than 0.60 and with a SHGC less than 0.40.

D. Glazing tint Colors: As selected from manufacturer's full range of colors

E. Thermal Barrier
1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
2. Sills are thermally broken with thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. All other frames and sash are thermally broken using the latest technology in two-part, high-density polyurethane. A nonstructural thermal barrier is unacceptable.

2.5 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances

and alignment with adjacent work.

E. Install sill and sill end angles.

F. Set sill members and sill flashing in continuous bead of sealant.

G. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

I. Install operating hardware not pre-installed by manufacturer.Install glass and infill panels in accordance with requirements specified in Section 088000.

J. Install perimeter sealant in accordance with requirements specified in Section 079005.

3.3 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.4 FIELD QUALITY CONTROL

A. Provide services of aluminum window manufacturer's field representative to observe for proper installation of system and submit report.

3.5 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and the same pressure difference as specified for laboratory testing.

B. If any window fails, test additional windows at Contractor's expense.

C. Replace windows that have failed field testing and retest until performance is satisfactory.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 6223

TUBULAR SKYLIGHTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly; configuration as indicated on the drawings.

B. Accessories.

1.2 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2010.

C. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2012.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engaged in manufacture of tubular skylights for minimum of 10 years.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under

environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Skylights: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. DayLite, Natural Lighting Technologies: www.dayliteco.com.

B. Solatube International, Inc: www.solatube.com.

C. Tubular Skylight Inc: www.tubular-skylight.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 TUBULAR SKYLIGHTS

A. Tubular Skylights: Transparent roof-mounted skylight dome and curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces.
   1. All components made and assembled by one manufacturer.
   2. Design to withstand the following loads without breakage or permanent damage to any parts, when tested in accordance with ASTM E330:
      a. Positive and negative wind load of 10 psf.
      b. No permanent deflection in excess of 0.2 percent of span.
      c. Live load of 100 psf on dome with safety factor of 3.
   3. Air Infiltration: Maximum 0.10 cfm per foot of crack length at 6.24 psf pressure differential when tested in accordance with ASTM E283.
   4. Water Resistance: No uncontrolled water leakage at 6.24 psf pressure differential with water rate of 5 gallons/h/sf, when tested in accordance with ASTM E331; design to ensure that water will not accumulate inside assembly.
   5. Thermal Movement: Fabricate to allow for thermal movement resulting from temperature differential from minus 30 to 180 degrees F.
   6. Flammability: Non-metal parts complying with the following:
      a. Roof-Top Components: Class B when tested in accordance with ASTM E108 or UL 790.
      b. Self-Ignition Temperature: Greater than 650 degrees F, when tested in accordance with ASTM D1929.
      c. Smoke Developed Index: Maximum of 450, when tested in accordance with ASTM E84; or maximum rating of 75, when tested in accordance with ASTM D2843.
      d. Combustibility - Light Transmitting Parts: Burning extent of 1 inch or less (ICC Class CC-1), when tested in accordance with ASTM D635 in the thickness intended for use.
      e. Combustibility - Non-Light Transmitting Parts: Minimum 2.5 inches/min (ICC Class CC-2), when tested in accordance with ASTM D635.

B. Roof Assemblies: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   1. Glazing: Polycarbonate plastic, 0.125 inch minimum thickness.
   2. Dome Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact ABS; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing; weather seal of medium density pile weather stripping.

C. Reflective Tube: ASTM B209 aluminum sheet, thickness between 0.015 inch and 0.020 inch.

D. Diffuser Assemblies: Supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration.
   1. Ceiling Ring: Edge trim for ceiling opening; injection molded high impact ABS.
   2. Diffuser Trim: Edge and attachment trim for diffuser lens; injection molded high impact ABS.
   3. Lens: Flush frosted lens.
   4. Lens Material: Polycarbonate plastic
   5. Visible Light Transmission: Minimum 90 percent.
   6. Seal: Closed cell EPDM foam rubber.
   7. Size: As indicated on Drawings.

2.3 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Joint Sealant: As specified in Section 07 9200.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Seal joints exposed to weather using procedures specified in Section 07 9200.

C. Conduct field test for water tightness; conduct water test in presence of Architect. Correct defective work and re-test until satisfactory.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

1.1

SECTION 087100
DOOR HARDWARE

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.

2.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

2.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

2.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

2.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

2.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

2.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 3 - PRODUCTS

3.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

3.2 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

3.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. McKinney (MK) - QC (# wires) Option.

B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - SER-QC (# wires) Option.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

3.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

a. Rockwood (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

a. Rockwood (RO).

3.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer's Standard.

C. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:

    a. Corbin Russwin (RU) - Access 3 AP.
    b. Sargent (SA) - Degree DG1.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

3.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

3.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.

3.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

3.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.

c. No catch points: addition of applied deflectors or other added components are not allowed.
d. No visible plastic.
e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
f. Constructed of all stainless steel.
g. Stainless steel pullman type latch with deadlock feature.
h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
j. Ten-year limited warranty for mechanical features.

2. Electromechanical exit devices shall have the following functions and features:

a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.
c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.

3. Manufacturers:

a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
b. Sargent Manufacturing (SA) - PE80 Series.

3.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 7500 Series.
c. Sargent Manufacturing (SA) - 351 Series.

3.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Rockwood (RO).

3.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Sargent Manufacturing (SA).

3.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

3.14 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 3280 Series.
b. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQL Series.

3.15 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

3.16 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

4.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

4.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

4.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

4.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

4.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

4.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

4.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. SU - Securitron
6. OT - Other

Hardware Sets

Set: 1.0

Doors: XD120, XD137

5	Hinge (heavy weight)	T4A3386	US32D	MK
1	Hinge, Full Mortise, Hvy Wt [Elec]	T4A3386 QCxx	US32D	MK
2	Flush Bolt	555 / 557 (As req'd) - 12" / 72" AFF	US26D	RO

1	Dust Proof Strike	570	US26D	RO
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Overhead Stop	590S	EN	SA
1	Surface Closer w Stop	351 CPS	EN	SA
2	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Astragal	355CS x Height		PE
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
2	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 2.0

Doors: X100, X200, X300, X400

1	Continuous Hinge	CFM__HD1 SER		PE
1	Rim Exit, ST	DG1 12 55 56 PE8804	US32D	SA
1	Pull	RM201	US32D	RO
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Sweep	315CN x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 3.0

Doors: X102, X202, X302

1	Continuous Hinge	CFM__HD1 SER		PE
1	Rim Exit, ST	DG1 55 56 PE8804	US32D	SA
1	Pull	RM201	US32D	RO
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
1	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 4.0

Doors: X101, X201, X301, X401, X402

1	Continuous Hinge	CFM__HD1		PE
1	Rim Exit, EO	PE8810	US32D	SA
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
1	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	Position Switch	DPS-M/W-WH (as required)		SU

Notes: Door status monitored.

Set: 5.0

Doors: D108A, D108B, D109, D110, D111, D126, D127, D128, D220

2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 6.0

Doors: D139

2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
1	Gasketing	S88D (Head & Jambs)		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 7.0

Doors: D119, D136

2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer w Positive Stop	351 PS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
3	Silencer	As req'd		RO
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 8.0

Doors: D107

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Privacy Lock w Indicator	V21 8265 LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
1	Gasketing	S88D (Head & Jambs)		PE

Set: 9.0

Doors: 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 217, 218, 219, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 417, 418, 419

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Entry Lock w Indicator	DG1 V21 8205 LNE	US26D	SA
1	Surface Closer w Positive Stop	351 PS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	S88D (Head & Jambs)		PE

Set: 10.0

Doors: D134

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	DG1 8237 LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO

Set: 11.0

Doors: D112, D129

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	DG1 8237 LNE	US26D	SA
1	Concealed Overhead Stop	690S	EN	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
3	Silencer	As req'd		RO

Set: 12.0

Doors: D114A, D131A

3	Hinge (heavy weight)	T4A3786	US26D	MK
1	Pull Plate	BF 110 x 70C	US32D	RO
1	Push Plate	70E	US32D	RO
1	Surface Closer	351 Reg / PA	EN	SA
1	Mop Plate	K1050 4" High x LDW CSK	US32D	RO
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO

Set: 13.0

Doors: D130, D131

1	Cannot Locate	Further Coordination Required		OT

END OF SECTION 087100

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SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for wood and hollow metal, and storefront doors.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Weatherstripping, seals and door gaskets.

1.2 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 – Flush Wood Doors.

B. Section 08 4313 - Aluminum-Framed Storefronts.

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

C. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; current edition.

D. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute. current edition

E. ICC A117.1 - Accessible and Usable Buildings and Facilities; International Code Council; current edition.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives. current edition

G. NFPA 101 - Life Safety Code; National Fire Protection Association. current edition

H. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc. current edition

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Convey Owner's keying requirements to manufacturers.

D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

D. Keying Schedule: Submit for approval of Owner.

E. Samples: Prior to preparation of hardware schedule:
   1. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
   2. Samples will be returned to supplier.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.

H. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

K. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Division 1 sections for additional provisions.
   2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience.

C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.8 WARRANTY

A. See Division 1 for additional warranty requirements.

B. Provide five year warranty for door closers.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers are as shown on the Door Hardware Schedule on the Drawings.

B. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

2.2 DOOR HARDWARE - GENERAL

A. Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. Hardware on Fire-Rated Doors, Except Hinges: Listed and classified by UL as suitable for the purpose specified and indicated.
   6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   7. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
   8. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

D. Function: Refer to drawings for required door functions.

E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

F. Fasteners:
   1. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.3 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
   1. Hardware Sets indicate locking functions required for each door.
   2. If no hardware set is indicated for a swinging door provide an office lockset.
   3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
   4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Electrically Operated Locks: Fail secure unless otherwise indicated.

C. Lock Cylinders: Manufacturer’s standard tumbler type, six-pin standard core.
   1. Provide cams and/or tailpieces as required for locking devices required.

D. Keying: Grand master keyed; coordinate with keying requirements.
   1. Include construction keying.
   2. When providing keying information, comply with DHI Handbook "Keying systems and nomenclature".

E. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.4 KEY CONTROLS

A. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.

B. Facility Manager's Key Cabinet: Sheet steel construction, piano hinged door with key lock.
   1. Mounting: Wall-mounted.
   2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
   3. Size key hooks to hold 6 keys each.
   4. Finish: Baked enamel, manufacturer's standard color.
   5. Key cabinet lock to building keying system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

E. Mounting heights for hardware from finished floor to center line of hardware item.
   1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

F. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.5 PROTECTION

A. Protect finished Work.

B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE

A. Door hardware models and manufacturer are as designated on the Door Schedule on the Drawings.

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing materials for windows, and doors.

B. Glazing compounds and accessories.

1.2 RELATED SECTIONS

A. Section 07 9200 - Joint Sealers: Sealant and back-up material.

1.3 REFERENCES

A. 16 CFR 1201 – Safety Standard for Architectural Glazing Materials, current edition.

B. ASTM C 1036 - Standard Specification for Flat Glass; current edition.

C. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; current edition.

D. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass, current edition

E. ASTM C 1193 - Standard Guide for Use of Joint Sealants; current edition.

F. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; current edition.

G. GANA (GM) - GANA Glazing Manual; Glass Association of North America; current edition.

H. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; current edition.

1.4 PERFORMANCE REQUIREMENTS

A. Provide impact resistant glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with materials described in Section 07 9200.
   2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
   3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with applicable code.
   1. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples of each glass type indicating color and tint properties, for Architect approval.

E. Manufacturer's Certificate: Certify that glass meets or exceeds specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. See Division 1 sections for additional warranty requirements.

B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Provide a five (5) year warranty to include coverage for delamination of laminated glass and replacement of same.

D. The Warranties submitted under this Section shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and the laws of governing jurisdictions and is in addition to and runs concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.2 SEALED INSULATING GLASS MATERIALS

A. Acceptable Manufacturers:
   1. Basis of Design: PPG Industries, Inc, “Starphire”: www.afgglass.com.
   5. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

2.3 SEALED INSULATING VISION GLASS

A. Applications: Exterior glazing unless otherwise indicated.

B. Space between lites filled with air.

C. 1” Double insulated glazing system (1/4” low-E tinted tempered glass, ½” airspace, ¼” clear tempered glass), color as selected by Architect.

E. Glass Performance Requirements (minimum)
   1. Winter Night-time U-value: 0.29
   2. Summer Day–time U-value: 0.27
   3. Visible Light Reflectance: 11%
   4. Shading Coefficient: 0.45
   5. Visible Light Transmittance: 70%
   6. Total Solar Energy Transmittance: 34%
   7. Total Solar Energy Reflectance: 28%
   8. Ultra-violet Light Transmittance: 18%
   9. Solar Heat Gain Coefficient: .39
   10. Light to Solar Gain: 1.79

2.5 GLAZING MATERIALS

A. Manufacturers:
   1. Norton Performance Plastics Corp.
   2. Pecora Corporation: www.pecora.com.
   3. Tremco, Inc: www.tremcosealants.com.
   4. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

B. Provide types for applicable setting method specified in GANA Glazing Manual and FGMA Sealant Manual except as specified otherwise. Do not use metal sash putty, non-skinning compounds, non-resilient preformed sealers or impregnated preformed gaskets.

C. Materials Exposed to View and Unpainted: Black.

D. Accessories: As required for complete installation. Include glazing points, clips, shims, angles, beads, gaskets and spacers. Provide primer-sealers and cleaners as recommended by glass and sealant manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

E. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install glass in accordance with recommendations and procedures in GANA Glazing Manual and FGMA Sealant Manual.

B. Install glass in accordance with storefront frame manufacturer recommendations and instructions.

C. Install glass with lines or waves horizontal.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.05 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 08 8300

MIRRORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass mirrors.
   1. Tempered safety glass.

1.2 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1036 - Standard Specification for Flat Glass; 2016.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

E. GANA (GM) - GANA Glazing Manual; 2008.

F. GANA (SM) - GANA Sealant Manual; 2008.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.5 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mirrors:
   1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com.
   2. Lenoir Mirror Co: www.lenoirmirror.com.
   3. Trulite Glass and Aluminum Solutions: www.trulite.com.
   4. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
   1. Thickness: 1/4 inch.
   2. Size: As indicated on drawings.

2.3 GLAZING COMPOUNDS

A. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.

2.4 ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.

C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Stainless steel clips.

F. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
   1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.
   2. Volatile Organic Content (VOC): Less than 7 percent by weight.
   3. Manufacturers:
      a. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com.

G. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep with 90 degree mitered corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.4 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 08 8723
SAFETY AND SECURITY FILMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazing film applied to existing and new glazing assemblies.

B. Wet Glaze Anchoring System.

C. New Glazing: Factory or shop install film to glazing before installation in frames.

D. Glazing assemblies to receive film are indicated on drawings.

1.2 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: New doors and windows with glazing to receive film.

B. Section 08 8000 - Glazing: New glazing to received film.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).

C. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

D. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

E. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).

F. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

G. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.

H. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.

I. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

J. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

K. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

L. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

M. Window 5.2 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

N. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

O. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Ownerural Glazing Materials.

P. GSA Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

Q. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

R. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches (102 mm) by 6 inches (152 mm), representing actual product, color, and patterns.

E. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

F. Specimen Warranty.

1.5 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications (SUBMIT WITH PROPOSAL): All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

B. Installer Qualifications (SUBMIT # 1 AND #2 WITH PROPOSAL): All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
   2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
      a. Name of building.
      b. The name and telephone number of a management contact.

c. Type of glass.
d. Type of film.
e. Amount of film installed.
f. Date of completion.

3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
4. Provide an application analysis to determine available energy cost reduction and savings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's 12 year warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Madico, Inc; Safety Shield 800 DG 45 PS SR : www.madico.com/#sle.

B. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. 3M Window Film, St. Paul, MN.
2. Armor Glass, San Diego, CA
3. Solar Gard, Saint-Gobain, Houston, TX
4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SAFETY AND SECURITY GLAZING FILM

A. Clear Safety and Security Window Film: 8 Mil Clear Safety and Security Window Film. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
1. Physical / Mechanical Performance Properties:
a. Film Color: Clear.
b. Tensile Strength (ÅSTM D 882): 30,000 psi.
c. Break Strength (ASTM D 882) (Per Inch Width): 240 lbs.
d. ASTM D 4830 Puncture Test: 141 lbs.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.
   a. Visible Light Transmission (ASTM E 903) (Exterior): 13 percent.
   b. Visible Light Transmission (ASTM E 903) (Interior): 12 percent.
   c. Emissivity: .88.
   d. U-Factor (Winter): 1.11.
   e. Shading Coefficient: .87.
   f. Ultraviolet Light Blocked: Greater than 99 percent.
   g. Solar Heat Gain Coefficient (ÅSTM E 903): 0.74.
6. Windstorm Protection
   a. Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 50 psf Design Pressure with use of Adhesive attachment system.
7. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.
   a. GSA Rating with minimum blast pressure and impulse of 7 psi and 36 psi.msec, respectively: “3B” (Low Hazard / High Protection).
   b. GSA Rating with minimum blast pressure and impulse of 11 psi and 55 psi.msec, respectively: “3B” (Low Hazard / High Protection).
8. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).
   a. Annealed Glass (1/4 inch) - Pass
   b. Tempered Glass (1/4 inch) - Pass

2.3 ATTACHMENT SYSTEMS

A. General: Subject to compliance with testing and performance requirements, provide the following perimeter attachment system.
   1. Wet-glaze: 4-sided Wet Glaze Anchoring System to achieve a GSA level 3A performance condition (with SafetyShield 800 film) when tested to open range blast loads of 9.0 psi and 46.0 PSI-ms on monolithic annealed glass.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

B. Verify glass is not cracked, chipped, broken, or damaged.

C. Verify that frames are securely anchored and free of defects.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.

C. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

D. Apply film to glass and lightly spray film with slip solution.

E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.

F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); current edition.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; current edition.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; current edition.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; current edition.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); current edition.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include lubrication schedules, adjustment requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.5 WARRANTY

A. See Division 1 sections for additional warranty requirements.

B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
   1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC; www.airolite.com.
   2. American Warming and Ventilating; www.awv.com.
   3. Construction Specialties, Inc; www.c-sgroup.com.
   4. Industrial Louvers, Inc; www.industriallouvers.com.
   5. Pottorff; www.pottorff.com.
   6. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

2.2 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.
   5. Hinged Units: Provide secondary frame to which louver frame is attached; non-ferrous hinges.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: To be determined.
   2. Blades: Straight.
   3. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   5. Aluminum Finish: Superior performing organic coatings; finish welded units after fabrication.

C. Wall Louvers Used in conjunction with HVAC Components: Specified in Division 23 sections.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.4 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Manufacturers:
      a. PPG Metal Coatings; Duranar: www.ppgideascapes.com.
      b. Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/sle.
      c. See Division 1 sections for substiution procedures.

2. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.

B. Color: To be selected by Architect.

2.5 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

C. Insect Screen: 18 x 16 size aluminum mesh.

D. Fasteners and Anchors: Stainless steel.

E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Coordinate with installation of mechanical ductwork.

3.3 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.4 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling and suspended grid framing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

E. Textured finish system.

1.2 REFERENCES

A. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members; current edition.

B. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.

C. ASTM C 36 - Standard Specification for Gypsum Wallboard; current edition.

D. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; current edition.

E. ASTM C 514 - Standard Specification for Nails for the Application of Gypsum Board; current edition.

F. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; current edition.

G. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; current edition.

H. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; current edition.

I. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness; current edition.

J. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; current edition.

K. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; current edition.

L. ASTM C 1396 - Standard Specification for Gypsum Board; current edition.

M. GA-600 - Fire Resistance Design Manual; Gypsum Association; current edition.

1.3

SUBMITTALS

A. Shop Drawings:
   1. Show locations, fabrication, and installation of control and expansion joints, in accordance with Gypsum Association Standards unless otherwise approved by Architect in writing. Include plans, elevations, sections, details of components, and attachments to other units of Work. Indicate special details associated with acoustic seals.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

D. Submit keyed plan showing all control joints per 3.04 this specification section.

1.4 QUALITY ASSURANCE

A. Contractor is responsible for design, engineering and construction of the gypsum board assemblies, including framing. Contractor may increase framing gage, reduce stud spacing or flange width as required to carry loads and span dimensions. Depth of stud web may not be changed without Architect's approval.

B. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

C. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five years of documented experience.

D. Gypsum that becomes wet from spills, weather or mechanical failure shall be replaced by Contractor at no cost to Owner.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies.

B. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

PART 2 PRODUCTS

2.1 METAL FRAMING MATERIALS

A. Metal Framing Manufacturers:
   1. USG: www.usg.com
   3. ClarkDietrich Metal Framing, Inc: www.clarkdietrich.com
   4. Marino-Ware: www.marinoware.com

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

C. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf. Where brittle finishes such as tile, stone or plaster are applied to framing, limit deflection of wall framing to L/360 at 5 psf.
   1. Studs: C shaped with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Curved partition components: Top tracks and runners to be factory rolled to required radius. In lieu of factory rolling provide pre-engineered tracks and runners by Flex-Ability Concepts, or approved substitute. www.flexc.com
   4. Ceiling Channels: C shaped.
   5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

D. Grid Suspension System for Interior Ceilings: ASTM C 645, direct hung system composed of main beams and cross-furring members that interlock.
   1. Acceptable Product: USG Interiors, Inc.: Drywall Suspension System.
   2. Substitutions: See Section 01 6000 – Product Requirements for substitution procedures.

E. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.

F. Partition Head to Structure Connections: Partition Head To Structure Connections: Provide track fastened to structure with legs of minimum 3 inch length to accommodate for minimum 1 inch deflection for friction fit of studs cut short.

G. Between stud wall blocking: Type and size appropriate to stud spacing.

2.2 WALL BOARD MATERIALS

A. Manufacturers:
   1. G-P Gypsum Corporation: www.gp.com
   2. National Gypsum Company: www.nationalgypsum.com
   3. USG Corporation: www.usg.com
   4. Temple-Inland: www.templeinland.com
   5. Substitutions: See Section 01 6000 Product Requirements for substitution procedures.

B. Gypsum Wallboard: ASTM C 36 and ASTM C 1396. Sizes to minimize joints in place; ends square cut.
   1. Type X: Fire resistant, UL or WH rated.
      a. Application: Schoolwide, unless noted otherwise.
      b. Thickness: 5/8” unless noted otherwise.
      c. Edges: Tapered.

C. Abuse-Resistant Wallboard: Interior fiber reinforced gypsum panels as defined in ASTM C1278.
   1. Application: School corridors.
   2. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629.
   3. Indentation: Level 1, minimum when tested in accordance with ASTM C1629.
   4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM D3273.
   5. Fire Resistance: Rated X, UL or WH listed.
   6. Thickness: 5/8 inch.

7. Edges: Tapered.

D. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2-inch-thick; 2-inch-wide coated glass fiber tape for joints and corners.

2.3 ACCESSORIES

A. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

B. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2-inch-wide, creased paper tape for joints and corners.
   2. Ready-mixed vinyl-based joint compound.

C. Textured Finish Materials: Latex-based compound; plain.

D. Screws: ASTM C 1002; self-piercing tapping type.

E. Screws: ASTM C 954; steel drill screws for application of gypsum board to loadbearing steel studs.

F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.

B. Suspended Ceilings: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

C. Studs: Space studs as scheduled.
   1. Extend partition framing to structure where indicated. Extend to minimum 4 inches above lay-in ceiling plane where not scheduled to extend to deck.
   2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than full height double studs at jambs.

E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
   1. Orientation: Horizontal.
   2. Spacing: As indicated.

F. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

G. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, toilet accessories, and hardware.

3.3 WALL BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Install cementitious backerboard in all wet locations.

D. Moisture Protection: Treat cut edges and holes in exterior gypsum soffit board with sealant.

E. Where partitions (rated or unrated) are scheduled to extend to the deck above, require all voids between track and deck to be filled with packing of unfaced glass fiber.

F. Terminate end walls or wing walls with smooth metal jambs, in lieu of exposed corners.

G. Provide at least ½” space between bottom edge of gypsum board and concrete floor with “Waterguard”.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joint Schedule: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long. At open spaces such as atriums and long hallways, space control joints equally. Obtain approval for control joints not specifically shown on plans from Architect and Owner prior to commencement of Work.
   2. Install at both jambs of all single leaf doors and at both jambs of pairs of doors.
   3. Install at intersection of all gypsum wall and gypsum ceiling planes. Joint at ceiling planes may be backer rod and sealant as contractor option.
   4. Install at all column fur outs and intersecting wall planes.
   5. Architect reserves the right to additional control joints to maintain aesthetic appearance of work.
   6. Install at doors and intersection of gypsum ceiling and wall planes to be covered by woodwork, crown molding or paneling.

B. Corner Beads: Galvanized, 26 gage minimum. Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.5 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish all gypsum board in accordance with ASTM C 840 Level 4.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.

3.6 TEXTURE FINISH

A. Required texture: Light-sand.

B. Apply finish texture coating by means required to match Architects approved sample.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2236

METAL LATH

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal lath for Portland cement plaster.

B. Furring for metal lath at ceiling/soffit applications without solid substrate.

1.2 REFERENCE STANDARDS

A. ASTM C1063 - Standard Specification for Metal Lath.

B. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Lath:
   1. Alabama Metal Industries Corporation : www.amico-online.com.
   2. Cemco : www.cemcosteel.com.
   3. Clarkwestern Dietrich Building System LLC : www.clarkdietrich.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FRAMING AND LATH ASSEMBLIES

A. Provide completed assemblies with the following characteristics:
   1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
   2. Maximum Deflection of Horizontal Assemblies: 1:360 deflection under deadloads and wind uplift.

2.3 FRAMING MATERIALS

A. Furring Channels: Formed steel, minimum 0.040 inch thick, 3/8 inch deep x 7/8 inch high, splicing permitted; galvanized.

B. Main Ceiling Channels: Formed steel, asphalt coated, minimum 0.05 inch thick, 3/4 inch deep x 1-1/2 inch high, single piece, no splicing; galvanized.

C. Hangers: Steel wire, of size and type to suit application, to support ceiling components in place to deflection limits as indicated.

D. Ceiling Hangers: Rolled steel sections, of size and type to suit application, to rigidly support ceiling components in place to deflection limits as indicated; galvanized.

E. Lateral Bracing: Formed steel, minimum 0.060 inch thick, size and length as required; galvanized.

2.4 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
   1. Weight: 2.5 lb/sq yd typical.
   2. Backed with treated paper.

B. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.

C. Strip Mesh: Expanded metal lath, the same weight as lath, 2 inch wide x 24 inch long; same finish as lath.

D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
   1. Material: Galvanized (zinc coated) sheet metal for all devices except control jointsto be zinc- alloy.
   2. Casing Beads: Galvanized, square edges.
   3. Corner Beads: Galvanized wire type (Kwik-Corner).
   4. Control Joints: Zinc alloy, “J” type, with 2 inch flanges.
   5. Weep Screed: Galvanized, for use at base of all walls terminating at foundation orroof.

2.5 ACCESSORIES

A. Fasteners: ASTM C1002 self-piercing tapping screws.

B. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION - GENERAL

A. Install interior lath and furring in accordance with ASTM C1063.

B. Set all accessory intersections and splices in polyurethane sealant.

C. Attached metal lath through the sheathing to structural framing member only.

3.3 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 36 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

G. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

H. Laterally brace suspension system.

3.4 CONTROL AND EXPANSION JOINTS

A. Locate joints as indicated on drawings.

B. Install control and expansion joints.

3.5 LATH INSTALLATION

A. Apply metal lath taut, with long dimension perpendicular to supports.

B. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

C. Lap sides of diamond mesh lath minimum 5 inches.

D. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

E. Place corner bead at external wall corners; fasten at outer edges of lath only.

F. Place base screeds at termination of plaster areas; secure rigidly in place.

G. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

H. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

I. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

J. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.6 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 2400

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes portland cement plaster system over metal lath.

1.2 REFERENCES

A. ASTM C 150 - Portland Cement.

B. ASTM C 206 - Finishing Hydrated Lime.

C. ASTM C 897 - Aggregate for Job-Mixed Portland Cement-Based Plasters.

D. ASTM C 926 - Application of Portland Cement-Based Plaster.

E. PCA - Portland Cement Plaster (Stucco) Manual.

1.3 RELATED SECTIONS

A. Section 09 9450 – Elastomeric Coating: Finishing plaster systems.

1.4 PERFORMANCE REQUIREMENTS

A. Fabricate horizontal elements to limit finish surface to 1:360 deflection under superimposed dead load and wind uplift loads.

1.5 SUBMITTALS

A. Product Data: Submit data on plaster materials, characteristics and limitations of products specified.

B. Samples: Submit two samples, 12 inches by 12 inches in size illustrating finish color and texture.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C 926 and PCA Portland Cement Plaster (Stucco) Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 PRE-INSTALLATION MEETING

A. Convene minimum one week prior to commencing Work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Exterior Plaster Work: Do not apply cement plaster when ambient temperature is less than 40 degrees F.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT PLASTER

A. Manufacturers:
   1. Holnam, Inc.
   2. The Quikrete Companies.
   3. United States Gypsum Co.
   4. W.R. Bonsal Co.
   5. Substitutions: Section 01 6000 – Product Requirements.

2.2 COMPONENTS:

A. Plaster Base Materials: Job Mixed ASTM C 926.
   1. Cement: ASTM C 150, Type I Portland cement.
   2. Lime: ASTM C 206, Type S.
   3. Aggregate: In accordance with ASTM C 897 and PCA Plaster (Stucco) Manual.
   4. Water: Clean, fresh, potable and free of mineral or organic matter, which can affect plaster.

B. Metal Lath and Accessories: Specified in Section 09 2236.

2.3 MIXES

A. Base Coats: Mix and proportion cement plaster basecoat in accordance with PCA Portland Cement Plaster (Stucco) Manual. Add glass fibers to basecoats at a rate of 94 pounds per sack of cement.

B. Finish Coat: Mix and proportion cement plaster finish coat in accordance with PCA Portland Cement Plaster (Stucco) Manual and manufacturer's instructions.

C. Mix only as much plaster as can be used prior to initial set.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

F. Do not retemper mixes after initial set has occurred.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the suitability of existing conditions before starting work.

B. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

C. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.

D. Mechanical and Electrical: Verify services within walls have been tested and approved.

3.2 INSTALLATION

A. Plastering:
   1. Apply plaster in accordance with ASTM C 926 and PCA Plaster (Stucco) Manual.

B. Three-Coat Application Over Metal Lath:
   1. Apply first coat to a nominal thickness of 3/8 inch.
   2. Apply second coat to a nominal thickness of 3/8 inch.
   3. Apply finish coat to a nominal thickness of 1/8 inch.

C. Three-Coat Application Over Solid Bases:
   1. Apply first coat to a nominal thickness of 1/4 inch.
   2. Apply second coat to a nominal thickness of 1/4 inch.
   3. Apply finish coat to a nominal thickness of 1/8 inch.

D. Moist cure base and brown coats. Apply brown coat immediately following initial set of scratch coat.

E. After curing, dampen previous coat prior to applying finish coat.

F. Apply finish coat to indicated color and texture to fine sand float texture with selected color in accordance with PCA Portland Cement Plaster (Stucco) Manual.

G. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

H. Moist cure finish coat for minimum period of 48 hours.

3.3 TOLERANCES

A. Maximum Variation from True Flatness: 1/8-inch in 10 feet.

3.4 ADJUSTING

A. Remove damaged or defective plaster by cutting and replace with specified materials to match adjacent plaster.

B. Fog coat non-uniform or discolored plaster with finish coat materials spray applied to entire finish coat surface.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units, panels and baffles.

1.2 REFERENCE STANDARDS

A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2009b.

B. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 2008.

C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

A. Product Data: Provide data on suspension system components.

B. Manufacturer's Installation Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.

1.6 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.7 MAINTENACE MATERIALS

A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Ceiling tile: Quantity equal to 10 percent of total installed of each type installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS AND BAFFLES

A. Drawings and specifications are based on manufacturer's literature from Rockfon, unless otherwise indicated. Other manufacturers to comply with the minimum levels of material and detailing indicated on the drawings and in the specifications and in conformance with provisions of Section 01 6000 – Product Requirements.

B. Acoustical Units

1. Acoustical Tiles, Panels, and Baffles: As scheduled in Finish Schedule on Drawings.
2. Units for Installation in Fire-Rated Suspension System: Listed and classified for the resistive assembly the suspension system is a part of.

2.2 SUSPENSION SYSTEM

A. Suspension Systems - General: ASTM C 635; die cut and interlocking components, withstabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
   1. Manufacture: Chicago Metallic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install new suspension system or components where existing is damaged or otherwise unusable.

B. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Locate system according to reflected plan shown on the drawings.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

L. Install light fixture boxes constructed of gypsum board above light fixtures in accordance withfire rated assembly requirements and light fixture ventilation requirements.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental toappearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

I. Install hold-down clips on panels within 20 ft of an exterior door.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient (luxury vinyl) tile flooring.

B. Resilient sheet flooring.

C. Resilient base.

D. Installation accessories.

1.2 REFERENCES

A. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; current edition.

B. ASTM F 1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2018)

C. ASTM F 1861 - Standard Specification for Resilient Wall Base; current edition.

D. ASTM D6329 – Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Champers; 1998 (Reapproved 2015)

E. ASTM F150 – Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018)

1.3 SUBMITTALS

A. See Division 1 sections for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.5 EXTRA MATERIALS

A. See applicable Division 1 sections for additional provisions.

B. Provide 100 sq ft of flooring, 200 lineal feet of base, of each type and color specified.

PART 2 PRODUCTS

2.1 MATERIALS - TILE FLOORING

A. Resilient Tile: Tile material is as scheduled in the Finish Schedule on the Drawings.

B. Sheet Vinyl Tile: Tile material is as scheduled in the Interior Finish Schedule on the Drawings.

B. Feature Strips: Of same material as tile.

C. Static Control Tile: Static dissipative tile as scheduled on the Interior Finish Selection Summary.

2.2 MATERIALS - BASE

A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set, style as

indicated on the drawings, and as follows:
1. Acceptable Product: As indicated in the “Interior Finish Schedule on the Drawings.

B. Substitutions: See Division 1 sections for substitution procedures.

2.3 TILE ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Moldings and Edge Strips: Metal.

D. Filler for Coved Base: Plastic.

E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
2. Alkalinity: pH range of 5-9.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove existing flooring and flooring adhesives, follow the recommendations of RFCI (RWP).

B. Prepare substrates for installation of flooring as recommended by adhesive and flooring manufacturer.

C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from container to ensure shade variations are consistent when tile is placed.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

G. Install feature strips and floor markings where indicated. Fit joints tightly.

3.4 INSTALLATION – SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less then 1/3 of roll width, match patterns at seams.

B. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.

C. Cut sheet at seams in accordance with manufacturer's instructions.

D. Seal seams in accordance with manufacturer's instructions.

E. Install as detailed on Drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.5 INSTALLATION - BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.7 PROTECTION OF FINISHED WORK

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6700

FLUID-APPLIED EPOXY FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied flooring and base.

B. Divider strips and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealers: Joint between base and wall surface.

B. Section 22 1006 - Plumbing Specialties: Recessed plumbing access cover frames.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2010e1.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, 12x12 inch in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 2 gallons of each color installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing work of this section with minimum three years experience.

C. Supervisor Qualifications: Trained by product manufacturer, under direct full time supervision of manufacturer's own foreman.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fluid-Applied Flooring:
   1. Crossfield Products Corp; Product Dex-oTex: www.crossfieldproducts.com.
   2. Sherwin-Williams Company; Armorseal 100% Solids Epoxy: www.protective.sherwin-williams.com.
   3. BASF Construction Chemicals-Building Systems: www.chemrex.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Fluid-Applied Flooring: Epoxy, two component, thermosetting.
   1. Base Coat: 1/8 inch thick; selected color.
   2. Top Coat: Epoxy, two component, thermosetting; 1/16 inch thick; selected color.
   3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648.
   4. Mildew Resistance: No growth.
   5. Color: As selected by Architect.

2.3 ACCESSORIES

A. Divider Strips: Zinc, 1/8 inch thick height to match flooring thickness, with anchoring features; color as selected.

B. Control Joint Strips: Match divider strips; 1/2 inch nominal width, 1/8 inch wide neoprene filler strip between side strips, with anchoring features, strip height to suit flooring thickness.

C. Cant Strips: Molded of flooring resin material.

D. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

E. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

D. Verify that wood sub-floors have 12 percent maximum moisture content.

E. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring materials manufacturer.

F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - STRIPS

A. Accurately saw cut substrate to install divider strips.

B. Install strips straight and level to locations indicated.

C. Install access panel recess frames.

D. Install cant strips at base of walls where flooring is to be extended up wall as base.

E. Install base divider strips to match floor pattern. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness indicated.

C. Finish to smooth level surface.

D. Install flooring in recessed type floor access covers.

E. At movable partitions install flooring under partitions without interrupting floor pattern.

F. Cove at vertical surfaces.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until cured.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and varnishes.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Mechanical and Electrical:
      a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated. Materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concrete masonry units in utility, mechanical, and electrical spaces.
   8. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2015.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

E. SSPC-SP 1 - Solvent Cleaning; 2015.

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

G. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, submit each color in each sheen available.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered un til color submittals for major materials not to be painted, such as masonry, have been approved.

D. Samples: Submit two paper chip samples, 4 by4 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

F. Manufacturer's Instructions: Indicate special surface preparation procedures.

G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints: www.ppgpaints.com/sle.
   3. Pratt & Lambert Paints: www.prattandlambert.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com.
   5. Valspar Corporation: www.valsparpaint.com.

C. Transparent Finishes:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints Flood Exterior Transparent Finishes: www.flood.com/sle.
   3. PPG Paints Sikkens ProLuxe Transparent Finishes: www.perfectwoodstains.com/sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com.

D. Stains:
   1. Behr Process Corporation: www.behr.com.
   2. PPG Paints Flood Exterior Stains: www.flood.com/sle.
   3. PPG Paints Sikkens ProLuxe Stains: www.perfectwoodstains.com/sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com.

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.

B. Wood, Opaque, Alkyd, 3 Coat:
   1. One coat of alkyd primer sealer.
   2. Sheen to be selected: Two coats of alkyd enamel.

C. Wood, Transparent, Varnish, No Stain:
   1. One coat sealer.
   2. Sheen to be selected: One coat of varnish.

D. Wood, Transparent, Varnish, Stain:
   1. Filler coat.
   2. One coat of stain.
   3. One coat sealer.
   4. Sheen to be selected: One coat of varnish.

E. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
   3. Sheen to be selected: Two coats of alkyd enamel.

F. Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer.
   2. Sheen to be selected: Two coats of latex enamel.

G. Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Sheen to be selected: Two coats of alkyd enamel.

H. Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanize primer.
   2. Sheen to be selected: Two coats of latex enamel.

I. Aluminum and Copper, Unprimed, Alkyd, 3 Coat:
   1. One coat etching primer.

2. Sheen to be selected: Two coats of alkyd enamel.

J. Paint E-Pav - Pavement Marking Paint:
1. White: One coat, with reflective particles.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Exterior Plaster and Stucco: 12 percent.
2. Fiber Cement Siding: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

2. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches. Allow to dry.
3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.

I. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

J. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

K. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

L. Asphalt, Creosote, or Bituminous Surfaces: Remove foreign particles to permit adhesion of finishing materials. Apply latex based sealer or primer.

M. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

N. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

O. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

P. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

Q. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

R. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

S. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

T. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123

INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and varnishes.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Surfaces inside cabinets.
   4. Prime surfaces to receive wall coverings.
   5. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Glass.
   11. Concrete masonry units in utility, mechanical, and electrical spaces.
   12. Acoustical materials, unless specifically indicated.
   13. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; Current Edition
C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; Current Edition
D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
E. SSPC-SP 1 - Solvent Cleaning; Current Edition
F. SSPC-SP 2 - Hand Tool Cleaning; Current Edition
G. SSPC-SP 6 - Commercial Blast Cleaning; Current Edition.
H. SSPC-SP 13 - Surface Preparation of Concrete; Current Edition

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, submit each color in each sheen available.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, factory finished metals, wood cabinets, and wood doors, have been approved.
D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
E. Manufacturer's Instructions: Indicate special surface preparation procedures.
F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Behr Process Corporation: www.behr.com.
2. PPG Paints: www.ppgpaints.com/sle.
3. Pratt & Lambert Paints: www.prattandlambert.com.
4. Sherwin-Williams Company: www.sherwin-williams.com.
5. Valspar Corporation: www.valsparpaint.com.

C. Transparent Finishes:
1. Behr Process Corporation: www.behr.com.
2. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com/sle.
3. Sherwin-Williams Company: www.sherwin-williams.com.

D. Stains:
1. Behr Process Corporation: www.behr.com.
2. PPG Paints Deft Interior Stains: www.ppgpaints.com/sle.
3. Sherwin-Williams Company: www.sherwin-williams.com.

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.

5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
   3. Top Coat Sheen: Sheens to be selected during submittals review period.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
   1. Shop primer by others.
   2. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
   3. Top Coat Sheen: Sheens to be selected during submittals review period.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

D. Paint I-OP-FL - Concrete Floors to be Painted.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Latex Floor Paint, Low Gloss; MPI #60.

E. Paint I-TR-C - Transparent Finish on Concrete Floors.
   1. 1 coat stain.
   2. Stain: Semi-Transparent Stain for Concrete Floors; MPI #58.
   3. Stain: Solid Color Stain for Concrete.
   4. Sealer: Water Based for Concrete Floors; MPI #99.
   5. Sealer Sheen: Sheens to be selected during submittals review period.

F. Paint I-TR -W - Transparent Finish on Wood.
   1. Top Coat(s): Polyurethane Varnish, High Build.
      a. Products:
         1) Sherwin-Williams MinWax High Build Polyurethane.

2) Sheens to be selected during submittals review period.
3) Substitutions: Section 01 6000 - Product Requirements.

2.4 PRIMERS

A. Primers: Provide the primer required or recommended by manufacturer of top coats.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units : 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

K. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

L. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

M. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

N. Galvanized Surfaces:
   1. Prepare surface according to SSPC-SP 2.

O. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

P. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

Q. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

R. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

S. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

B. Owner will provide field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9725

CONCRETE FLOOR SEALER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete floor sealer. Specialized reactive chemicals that penetrate concrete to seal, densify and harden the concrete.

1.2 RELATED SECTIONS

A. Section 03 3000 - Cast-in-Place Concrete.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, including surface preparation and application instructions.

C. Maintenance Instructions: Submit manufacturer's maintenance and cleaning instructions.

1.4 PERFORMANCE REQUIREMENT

A. Provide product that utilizes specialized reactive chemicals that penetrate concrete to seal, densify and harden the concrete.

B. General Contractor is to protect all concrete floors which are to have sealant applied. Areas should be free of stains, oils, cleaning agents, debris and dust prior to sealing.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Successful experience in application of similar concrete floor sealers.
   2. Employ persons trained for application of concrete floor sealers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name.

B. Storage: Store materials in a clean, dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready for use.
   1. Concrete Floor Sealer: Keep away from ignition sources. Do not allow to freeze.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply concrete floor sealer when air or surface temperature is below 40 degrees F.

B. Exterior Surfaces: Do not apply materials in wet weather.

1.8 SEQUENCING

A. Prepare surface and apply concrete floor sealer after interior finish work is completed and before baseboards are installed.

1.9 APPLICATION LIMITATIONS

A. Do not apply sealer where other floor finish materials are scheduled.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacturer
   1. BASF
      a. Substitutions not permitted.

2.2 CONCRETE FLOOR SEALER

A. Concrete Floor Sealer:
   1. BASF Lapidolith Concrete Hardener and Dustproofer.
      a. Substitutions not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive concrete floor sealer. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

A. Protection:
   1. Protect walls and surrounding surfaces not to receive concrete sealer.
   2. Do not allow sealer to come in contact with wood, glass or metal surfaces.

B. Prepare concrete surface in accordance with manufacturer's instructions.

C. Ensure concrete is a minimum of 7 days old.

D. Ensure concrete surface is clean, dry, structurally sound, and free from dirt, dust, oil, grease, solvents, paint, wax, asphalt, concrete curing compounds, sealing compounds, surface hardeners, bond breakers, adhesive residue, and other surface contaminants.

E. Do not acid wash or use heavy alkali cleaners.

3.3 APPLICATION

A. Concrete Floor Sealer: Apply concrete floor sealer over concrete floor in accordance with manufacturer's instructions.

B. Keep material containers closed when not in use to avoid contamination.

C. Do not apply sealer where other floor finish materials are scheduled.

3.4 PROTECTION

A. Protect concrete surfaces from foot traffic for a minimum of 24 hours.

B. Avoid washing concrete surfaces for a minimum of 48 hours.

END OF SECTION

SECTION 10 1400

TRAFFIC AND PARKING SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Providing post-mounted and surface mounted site traffic signage where indicated.

1.02 ACTION SUBMITTALS

A. General: Submit the following:

B. Product Data: Manufacturer's data for each type of sign and post indicated.

1.03 INFORMATIONAL SUBMITTALS

A. Manufacturer's installation instructions, for information only.

1.04 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of five years' experience in the manufacturing of traffic signage of the type specified for this Project.

B. Codes and Standards: Comply with the City of Phoenix Building Code, latest edition, and other requirements of authorities having jurisdiction.

1.05 PRODUCT DELIVERY

A. Deliver materials in factory packages with factory labels attached.

B. Cover and protect material in transit and at job site. Damaged or defaced material will be rejected and shall be replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide traffic sign with post where shown on the Drawings and as specified.

2.02 MATERIALS

A. Signs: 18 gage galvanized steel.

B. Posts: Galvanized Steel flanged channels weighing 4 pounds per foot, length as required for proper mounting height and scheduled foundation embedment depth.

C. Bolts, Nuts, Washers, and Clamps: Cadmium or galvanized steel. Bolts shall be a minimum of 5/16" in diameter. Clamps shall be two-piece assemblies of at last 14 gage steel or shall be an adjustable steel strap bracket.

D. Concrete for foundations: 2500 psi minimum, complying with Section 03 3000.

2.03 SCHEDULE

A. Handicapped Parking Sign Type 1: 12" x 18", 18 gage steel sheet with baked enamel finish. See Drawings for sign graphics and wording.

B. Other Signs: As designated on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

B. Provide forms where required due to unstable soil conditions and for perimeter of sign pole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

C. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist cure exposed concrete for not less than seven days or use nonstaining curing compound.

END OF SECTION

SECTION 10 2113.13

METAL TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stainless steel toilet compartments and urinal screens.

1.2 REFERENCE STANDARDS

A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall, floor, and ceiling supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Toilet Compartments:
   1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
   2. General Partitions Mfg. Corp: www.generalpartitions.com/#sle.
   3. Global Steel Products Corp: www.globalpartitions.com/#sle.
   4. Metpar Corp: www.metpar.com/#sle.
   5. Substitutions: Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Stainless Steel Sheet: ASTM A666, Type 304.

2.3 COMPONENTS

A. Toilet Compartments: Stainless steel, floor mounted..

B. Doors, Panels, and Pilasters: Sheet steel faces, pressure bonded to sound deadening core, formed and closed edges; corners made with corner clips or mitered, welded, and ground smooth.
   1. Panel Faces: 20 gage, 0.0359 inch.
   2. Door Faces: 22 gage, 0.0299 inch.
   3. Pilaster Faces: 20 gage, 0.0359 inch.
   4. Reinforcement: 12 gage, 0.1046 inch.

5. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.

C. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Door Width: 24 inch.
   3. Door Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 58 inch.

D. Pilasters: 1-1/4 inch thick, of sizes required to suit compartment width and spacing.

E. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

F. Urinal Screen Splash Panels: Stainless steel sheet 30 inch wide by 42 inch high mounted on partitions adjacent to urinals. Fasten with stainless steel screws spaced 8 inches on center.

2.4 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Head Rails: Hollow chrome-plated steel tube, 1 by 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Brackets: Satin stainless steel.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

E. Hardware: Polished chrome plated non-ferrous cast metal:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Nylon bearings.
   3. Thumb turn or sliding door latch with exterior emergency access feature.
   4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   5. Coat hook with rubber bumper; one per compartment, mounted on door.
   6. Provide door pull for outswinging doors.

2.5 FINISHING

A. Stainless Compartments: #4 brushed stainless finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that field measurements are as indicated.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2601

WALL AND CORNER GUARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Corner guards.

1.2 REFERENCE STANDARDS

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.3 SUBMITTALS

A. See Section 01 3300 – Submittal Procedures, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Corner Guards, Stainless Steel (Where indicated on Drawings) - Flush Mounted:
   1. Material: Type 304 stainless steel, 430 finish.
   2. Performance: Resist lateral impact force of 100 lbs at any point without damage orpermanent set.
   3. Width of Wings: 1-1/2” inches.
   4. Corner: Square.
   5. Length: 96”.
   6. Mounting: Adhesive, surface mount.
   7. Inpro Corporation, 430 finish.

B. Adhesive: PL Premium Heavy Duty Adhesive, as recommended by manufacturer.

2.2 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on Drawings.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, securedrigidly in position to wall framing members only.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Accessories for toilet rooms and janitor rooms.

1.2 RELATED REQUIREMENTS

A. Section 10 2113 – Plastic-Laminate Clad Toilet Compartments.

1.3 REFERENCE STANDARDS

A. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2010.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

C. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2003 (Reapproved 2009).

D. ASTM C1036 - Standard Specification for Flat Glass; 2006.

E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Samples: Submit two samples of each accessory, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Toilet Accessories:
   1. A & J Washroom Accessories Inc: www.ajwashroom.com.
   2. American Specialties, Inc: www.americanspecialties.com.
   3. Bobrick Washroom Equipment, Inc.: www.bobrick.com
   4. Bradley Corporation: www.bradleycorp.com.
   5. Substitutions: See Section 01 6000 for substitution requirements.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 3 keys for each accessory to Owner; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.

E. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4 TOILET ROOM ACCESSORIES

A. Partition Mount Dual Toilet Paper Dispenser: Bobrick B-2888.

B. Semi Recess Mount Paper Towel/Waste Receptacle: Bobrick B-3644.

C. Soap Dispenser: Stainless steel, surface mount, liquid soap dispenser: Bobrick B-4112.

D. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
   1. Size: 20” W x 42” H.
   2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

E. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.

F. Sanitary Napkin Dispenser: Stainless steel, surface mount, Bobrick 2706 25.

G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

H. Hat and Coat Hook: Stainless steel, partition mount, Bobrick B-7682.

I. Substitutions: Under provisions of Section 01 6000.

2.5 JANITOR ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: 3 spring-loaded rubber cam holders.
   2. Length: 36 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

3.3 SCHEDULE

A. All accessories manufacturers and model numbers are scheduled in the Toilet Accessories Schedule on the Drawings.

END OF SECTION

SECTION 10 4116
EMERGENCY KEY BOX

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire Department Key Box.

1.2 SUBMITTALS

A. See Division 1 sections, for submittal procedures.

B. Product Data: Provide manufacturer’s product literature.

C. Shop Drawings: Indicate installation instructions and key box location.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver key boxes to project site in manufacturer’s original shipping container.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Knox Company. www.knoxbox.com

B. Substitutions: See Division 1 sections for substitution procedures.

2.2 MANUFACTURED UNITS

A. Basis of Design Product: Knox-Box 3200 Series, hinged door model with recessed mounting kit, aluminum color.

B. Substitutions: See Division 1 sections for substitution procedures.

2.3 APPLICATIONS

A. Emergency key box located for use of the Fire Department.
   1. Location: Locate near the fire sprinkler room door at a height between 6 foot and 8 footabove finished grade. Refer to drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that surrounding components are complete and are acceptable for installation of emergency key boxes.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in any direction.

3.4 ADJUSTING

A. Adjust hinged door for smooth operation.

3.5 CLEANING

B. Clean emergency key box after installation

3.6 PROTECTION

C. Protect installed emergency key box from subsequent construction operations.

END OF SECTION

SECTION 10 4300
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. First aid cabinets.

D. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 9123 - Interior Painting: Field paint finish.

1.3 DEFINITIONS

A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA)-approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

1.4 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Automated External Defibrillators (AEDs):
   1. Philips Medical Systems; www.usa.philips.com/#sle.
   2. Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p: www.stryker.com/#sle.
   3. ZOLL Medical Corporation; www.zoll.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Emergency Aid Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com/#sle.

2. Modern Metal Products, a division of Technico, Inc: www.modern-metal.com/#sle.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.2 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.
   1. Provide automated external defibrillators (AEDs) as indicated.

2.3 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

C. Fire-Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.

D. Cabinet Configuration: Recessed type.
   1. Size to accommodate AED.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with two butt hinges.

F. Door Glazing: Tempered glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

J. Finish of Door Pull or Handle: Stainless steel.

K. Finish of Cabinet Interior: White powder coat.

2.4 ACCESSORIES

A. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.

B. Alarm Contacts: Contact devices.

C. Cabinet Door Signage: 'AED” decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

D. Plastic Wall Signage: Flat style.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings,42 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place AEDs in cabinets.

E. Wall Signs:
   1. Location: Where shown.
   2. Apply on walls after field painting is completed and has been accepted.

F. Cabinet Lettering:
   1. Location: Face of door framing.
   2. Apply lettering on field-painted cabinets after painting is complete and has been accepted.
   3. Apply lettering on factory-finished cabinets either at the factory or just prior to Substantial Completion.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.4 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for closeout submittals.

B. See Section 01 7900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Cabinets for portable fire extinguishers.

B. Portable fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Subject to compliance with requirements, provide products by one of the following:
      a. Babcock Davis
      b. GMR International Equipment
      c. Guardian Fire Equipment
      d. JL Industries
      e. Larsens Manufacturing Company
      f. Nystrom, Inc.
      g. Strike First Corporation

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet or aluminum sheet.

D. Recessed Cabinet:
   1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
   2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material: Same material and finish as door.

G. Door Material: .036-inch steel sheet or aluminum sheet, reinforced for rigidity, magnetic or friction latch.

H. Door Style: Horizontal duo panel with frame, Vertical duo panel with frame, Center glass panel with frame, or Solid opaque panel with frame. Hinge doors for 180 degree operation with continuous piano hinge.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

K. Accessories:
   1. Extinguisher Brackets: Formed steel, chrome plated.
   2. If extinguisher is not located in a cabinet, provide bracket no. 860.
   3. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
   4. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
   5. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Architect.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door.
         2) Application Process: Silk-screened, Engraved, Etched.
         3) Lettering Color: Red, Black.
         4) Orientation: Vertical.

L. Materials:
   1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.
   2. Aluminum: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 for extruded shapes.
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.
   3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

2.4 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

B. Subject to compliance with requirements, provide products by one of the following:
   1. Ansul Incorporated, Tyco International
   2. Babcock Davis
   3. Badger Fire Protection
   4. Guardian Fire Equipment
   5. JL Industries
   6. Kiddie Residential and Commercial
   7. Larsens Manufacturing
   8. Pyro-Chem
   9. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

C. Multipurpose Dry-Chemical Type (MP): UL-rated 10 Pound nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.5 MOUNTING BRACKETS

A. Mounting Brackets: Where no cabinet is called for on the Drawings, provide manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for recessed and semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated.

E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Examine fire extinguishers for proper charging and tagging.

G. Remove and replace damaged, defective, or undercharged fire extinguishers.

H. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

I. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

SECTION 10 7316

PREMANUFACTURED ALUMINUM CANOPIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work of this section includes furnishing and installation of manufactured extruded aluminum overhead canopies.

1.2 QUALITY ASSURANCE

A. Manufacturer and erector shall demonstrate experience of a minimum of five years in this type of project.

1.3 FIELD MEASUREMENT

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

C. If requested, supply manufacturer's standard literature and specifications for canopies.

D. Confirm dimensions prior to preparation of shop drawings when possible.

1.4 PERFORMANCE REQUIREMENTS

A. Canopy must conform to local building codes.

B. Provide calculations for loadings and stresses, stamped by a Professional Structural Engineer, licensed in the State of Texas.

C. Provide details and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer licensed in the State of Texas.

D. Canopy design to resist live loads shown in applicable building codes.

1.5 DELIVER, STORAGE, HANDLING

A. Deliver and store all canopy components in weather protected areas.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Mapes Canopies; www.mapescanopies.com.

B. Substitutions permitted under provisions of Section 01 6000 – Product Requirements.

2.2 MATERIALS

A. Decking to be 3" extruded flat soffit .078 decking

B. Fascia shall be standard 24" extruded, configured as shown on Drawings.

C. Attachment hardware shall be powder coated to match canopy.

D. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in manufacturer's current brochures.

2.3 FINISHES

A. Finishes to be selected by Architect.

2.4 FABRICATION

A. All connections shall be mechanically assembled utilizing 3/16” fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.

B. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.

C. Concealed drainage. Water shall drain from covered surfaces into integral fascia gutter and directed to either the front for front drainage or to the rear for ground level discharge via one or more designated downspouts.

PART 3 EXECUTION

3.1 INSPECTION

A. Confirm that surrounding area is ready for the canopy installation.

B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by the manufacturer’s approved submittals.

C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed.

3.2 INSTALLATION

A. Installation shall be in strict accordance with manufacturer’s shop drawings. Particular attention should be given to protecting the finish during handling and erection.

3.3 PROTECTION

A. After installation, entire system shall be left in a clean condition.

END OF SECTION

SECTION 12 2400
MANUAL ROLLER SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior manual roller shades.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.

B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute Current Edition.

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.

D. WCMA A100.1 - Safety of Window Covering Products 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.

ɲns: An organization recognized by OSHA
oratory (NRTL) and acceptable to

1.7 MOCK-UP

D. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.9 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Interior Manually and Automatically Operated Roller Shades:
   1. Mechoshade Systems.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 ROLLER SHADES

A. Type A:
   1. Mecho/5X.
   2. Control System: Manual.
   3. Pocket: #4158.
   4. Shade Material: ThermoVeil 1500 Series.

2.3 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
   2. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quartz countertops for architectural cabinetwork.

1.2 REFERENCES

A. ANSI A208.1 - American National Standard for Particleboard; current edition.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; current edition.

C. ANSI Z124.3 - American National Standard for Plastic Lavatories; current edition.

D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.

E. AWI/AWMAC (QSI) - Quality Standard Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2006, 8th Ed., Version 2.0.

F. ISSFA-2 - Classification and Standards for Solid Surfacing Material; International Solid Surface Fabricators Association; current edition

1.3 SUBMITTALS

A. See Division 1 sections for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installation by fabricator.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOP ASSEMBLIES

A. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3- 01 and NEMA LD 3; orthophthalic polyester resin, mineral fiber, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   1. Manufacturers:
      a. Basis of Design: Cosentino.
      b. Basis of Design is provided to establish a standard of quality and configuration, and is not intended to preclude the use of accepted alternates.
   2. Exposed Edge Treatment: Bullnose.
   3. Back and End Splashes: Same material, thickness as recommended by manufacturer.
   4. Fabricate in accordance with AWI/AWMAC Quality Standards Illustrated Custom Grade.
   5. Color Selection: As designated on Finish Schedule on Drawings.

2.2 ACCESSORY MATERIALS

A. Plywood for Supporting all Substrate: FSC Certified PS 1 Exterior Type, AC veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Cove Molding for Top of Splashes: Rubber with semi-gloss finish and T-spline to fit between splash and wall; 1/2 inch by 1/2 inch; color as selected. To be applied to all splashes with the exception of tile splashes.

D. Joint Sealant: Mildew-resistant silicone sealant, color approved by Architect. To be applied at all casework and millwork joints, corners and where at dissimilar materials.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.
   1. Where indicated use rubber cove molding.
   2. Where applied cove molding is not indicated use specified sealant.

3.4 TOLERANCES

A. Variation from Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset from Wall, Countertops: 1/8 inch maximum, 1/16 inch, minimum.

C. Field Joints: 1/16 inch, wide, maximum.

3.5 CLEANING AND PROTECTION

A. Clean countertops surfaces thoroughly.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 329200
SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

1. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Site and Street Furnishings, as shown on the Contract Drawings, and as specified herein this Section.
2. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   a. Tables
   b. Chairs
   c. Benches
3. Related Sections: The following Sections contain requirements of Work that relate to this Section:
   a. Section 329113 – Soil Preparation.
   b. Section 329300 – Exterior Plants
   c. Section 329813 – Landscape Establishment Period.

1.2 SUBMITTALS

1. General: Submit four (4) bound booklets. Each booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other identification methods) and legible information on the following required information indicated herein this Section.
2. Shop Drawings to show component parts, fabrication, installation, and dimensions for items indicated herein this Section.
3. Samples:
   a. Submit manufacturer's product data for review, including color charts.
   b. Samples of complete Units or parts of Units of the items indicated herein this Section shall be furnished, as requested by Landscape Architect, for review and approval.
   c. Submit manufacturer's written certification that each product complies with specified requirements noted herein.
4. Certification: Provide certification from each manufacturer, as specified herein this Section, that their product(s) meet the specific criteria associated for sustainable products.
5. Submittals may be rejected if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; of if the required information is not included.

6. Work shall not proceed until Submittals have been reviewed and approved by the Landscape Architect.

1.3 QUALITY ASSURANCE AND CONTROL

1. All materials and Work shall be in accordance with the State Codes and Specifications and other criteria herein specified.
2. Single-Source Responsibility: Obtain furnishing Units from each respective single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
3. Substitutions: Unit(s) to be considered equal to those specified herein this Section shall be reviewed and approved by the Landscape Architect, in writing, prior to the Bid Date. No substitutions shall be allowed after the Bid Date.

1.4 COORDINATION

1. Contractor shall coordinate the installation of all furnishings in this Section with all other related Work of this Contract.
2. Contractor shall be responsible for verifying the dimensions and required hardware of the furnishings prior to commencing installation Work.
3. Coordinating furnishing footings with utility locations. Note potential conflicts to the Landscape Architect.

1.5 DELIVERY, STORAGE AND HANDLING

1. Furnishings shall be stored as necessary to prevent damage and shall be in new condition when ready for installation. It shall be the responsibility of the Contractor to install “factory condition” furnishings.

PART 2 - PRODUCTS

2.1 See Drawings.

PART 3 - EXECUTION

3.1 INSPECTION

1. Examine the areas and conditions under which site furnishing units are to be installed and remedy any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Landscape Architect.

3.2 INSTALLATION

a. Verify exact locations (both at ground level and on-structure) with the Landscape Architect prior to installation.
b. Use actual Unit(s) to establish all dimensions for installation.

c. Erect and install Unit(s) in accordance with the Manufacturer's instructions and recommendations. Install unit(s) plumb, accurately, and in the correct orientation and relationship with other site furnishings, elements and/or paving as shown on the Contract Drawings.
d. Install all anchorage and mounting hardware, as applicable, in strict accordance with Manufacturer's instructions, and as directed by the Landscape Architect.

3.3 PROTECTION

1. Protect installed furnishings against damage throughout the duration of the construction period, complying with Manufacturer's directions.
2. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of the work. Paint exposed areas with paint or other material as supplied by the Manufacturer of the damaged Unit. Apply by brush, to thickness recommended by paint manufacturer.

END OF SECTION 129300

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SECTION 22 13 01
SANITRY SEWERAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Buried sewer pipe and fittings.

B. Exposed and embedded soil, waste, drain, and vent piping.

C. Valves.

D. Floor drains.

E. Gutter and trench drains.

F. Battery room floor drains.

G. Cleanouts.

H. Piping specialties.

I. Flashings.

J. Escutcheons.

K. Neutralizing sumps.

L. Sewage ejectors.

M. Interceptors and tanks.

1.02 RELATED SECTIONS

A. Site sanitary sewerage system is specified in Section 33 31 00 - Sanitary Utility Sewerage Piping. Coordinate the work of this Section with the work of Section 33 31 00 - Sanitary Utility Sewerage Piping, as required for a complete and finished sanitary sewerage system.

1.03 MEASUREMENT AND PAYMENT

A. Separate measurement or payment will not be made for the work required under this Section. All costs in connection with the Work specified herein will be considered to be included or incidental to the Work of this Contract.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A48 Specification for Gray Iron Castings
2. ASTM A74 Specification for Cast Iron soil Pipe and Fittings
3. ASTM D4021 Specification for Glass-Fiber-Reinforced Polyester Underground Petroleum Storage Tanks
4. ASTM C4 Clay Drain Tile
5. ASTM C14 Concrete Sewer, Storm Drain, and Culvert Pipe (ASTM C14M Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]).
6. ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings.
7. ASTM C443 Joints for Circular Concrete Sewer and Culvert Pip, Using Rubber Gaskets (ASTM C443M – Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric}.
8. ASTM C564 Rubber Gaskets for Cast iron Soil Pipe and Fittings.
9. ASTM C700 Perforated. Vitrified Clay Pipe, Extra Strength, Standard Strength, and
10. ASTM C1053 Borosilicate Glass Pipe and fittings for Drain, Waste, and Vent (DWV) Applications.
11. ASTM D1785 120. Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and
12. ASTM D2235 Solvent Cement for Acrylonitrile – Butadiene – Sryrene (ABS) Plastic Pipe and Fittings.
13. ASTM D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
14. ASTM D2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
15. ASTM D2661 Acrylonitrile – Butadiene – Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
16. ASTM D2662 Polybutylene (PB) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

17. ASTM D2665 Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

18. ASTM D2666 Polybutylene (PB) Plastic Tubing.

19. ASTM D2683 Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

20. ASTM D2729 Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

21. ASTM D2751 Acrylonitrile – Butadiene – Styrene (ABS) Sewer Pipe and Fittings.

22. ASTM D3034 Type PSM Poly (Vinyl Chloride) Sewer Pipe and Fittings.

23. CISPI 301 Coast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

24. CISPI 310 Joints for Hubless Cast Iron Sanitary Systems.

B. Manufacturer's Standardization Society of Valve and Fitting industry (MSS):

1. MSS SP-70 Cast Iron Valves, Flanged and Threaded Ends

2. MSS SP-80 Bronze Gate, Globe, Angle and Check Valve

C. Texas Department of Transportation (TXDOT):

TXDOT Bridge Design Specifications, Part 3,

Loads

1.05 SUBMITTALS

A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Shop Drawings: Submit Shop Drawings showing piping layouts, sizes, types, valves, drains, cleanouts, sewage structure ejector station, and air compressor assembly.

C. Product Data: Submit manufacturers' product data for specified materials and equipment.

D. Operation and Maintenance Data: Submit equipment manufacturer's printed operating and maintenance instructions in accordance with Section 01 78 23 - Operation and Maintenance Data, consisting of detailed parts list, recommended spare parts list, and complete operation and maintenance procedures.

E. Test Reports: Submit certified test reports of valves and equipment, as applicable.

1.06 SITE CONDITIONS

A. Excavations shall be dry immediately before and after products are installed. Provide surfaces and structures to, and on, which sewerage products will be installed capable of supporting the products. Complete construction, which will be concealed by sewerage products before sewerage products are installed.

B. Coordinate the installation of the sanitary sewerage system with other building systems and components so as to avoid conflicts of installation. Drawings are diagrammatic and not necessarily to scale. Do not scale drawings for exact locations of installation of pipelines, valves, and equipment.

PART 2 - PRODUCTS

2.01 BURIED SEWER PIPE AND FITTINGS

A. Piping below grade shall be Class H as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC.

B. Piping buried below slabs on grade and piping in the crawl space under platform slabs shall be cast iron sewer pipe, Class B, as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC, or ASTM A74 bell-and spigot cast iron sewer pipe with joints made tight and sealed in accordance with Engineer- approved shop details.

C. Ejector pump discharge lines shall be Class H as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC.

D. Acid waste, drainage, and vent piping shall be Class H pipe and fittings as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC.

2.02 EXPOSED AND EMBEDDED SOIL, WASTE, DRAIN, AND VENT PIPING

A. Provide Class B cast iron soil pipe and fittings as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC, for non- pressure piping.

B. Provide Class E copper tube as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC s, for HVAC condensate pan drain.

C. Provide Class C steel pipe and fittings as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC, for ejector pump discharge.

2.03 VALVES

A. General: Provide valves of types indicated.

B. Gate and Check Valves: Refer to Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC, for gate valves and swing check valves.

C. Backwater Valves: Provide backwater valves with cast iron bodies, hinged flaps, and seats, bolted covers, bronze trim, and flaps and seats removable through covers. Disc shall allow leakage, which will eliminate blocking of the valve by the bridging of solids on the upstream side. Flaps shall be sensitive to backflow, and capable of closing immediately upon backflow.

D. Trap Primer Unit: Provide automatic trap primer valve, copper or cast bronze, 150 psi operating pressure, solder joint ends, with internal air gap, in-line type, complete with distribution unit.

2.04 FLOOR DRAINS

A. Provide floor drains manufactured of heavy cast iron with double drainage flange, sediment bucket, integral seepage pan, trap primer connection, and clamping collar for waterproofing membrane.

B. Provide heel proof strainer of chromium-plated cast brass, polished brass or buff polished nickel alloy, as indicated, sized to match floor drain and attached to a bronze threaded collar for adjustment to varying floor thickness.

C. Provide cast-iron extra heavy traffic pattern floor drains where indicated.

2.05 GUTTER AND TRENCH DRAINS

A. Provide gutter and trench drains manufactured of heavy cast iron with sediment bucket, integral anchor flange and flashing clamp where membrane is provided. Provide cast iron, extra heavy traffic pattern gutter trench drains, where indicated. Provide cast ductile iron anti-tilt grate unless otherwise indicated.

1. Coordinate with the requirements for trench drains specified in Section 05 50 00 - Metal Fabrications.

2.06 BATTERY ROOM FLOOR DRAIN

A. Cast iron body with acid resistant enameled interior and enamel coated dome strainer, bottom outlet with aperture joint to suit PVC pipe connection, heavy-duty, round flange flashing collar with weepholes.

2.07 CLEANOUTS

A. Provide cleanouts of cast iron conforming to ASTM A48, Class 25B and of sizes indicated.

B. Floor cleanouts shall be adjustable type, and shall have scoriated nickel alloy cover and, if for membrane waterproofed floors, a clamping device.

C. Wall cleanouts shall be bolted wedge type having a cover. Cover shall be satin stainless steel in flanged frame secured to plug with a vandal-proof screw.

D. Exposed cleanouts shall have raised brass head cleanout plug.

E. Grade cleanouts shall have adjustable sleeve-type housing, threaded brass plug with countersunk slot, and cast iron frame and cover.

2.08 PIPING SPECIALTIES

A. Gaskets for flanged joints shall be as specified in Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC.

B. Couplings for connecting above ground and underground piping shall be specifically designed for the purpose required with transition type gaskets.

2.09 FLASHINGS

A. Provide either soft-tempered or cold-rolled copper, weighing not less than 16 ounces per square foot, or sheet lead, weighing not less than four pounds per square foot.

2.10 ESCUTCHEONS

A. Provide as specified in Section 20 20 13 - Pipe Sleeves, Supports and Anchors for Facility Services

2.11 NEUTRALIZING SUMPS

A. Provide sump molded in one piece from polyethylene with NPT connections and having minimum capacity of 15 gallons or 1.33 cubic feet of usable volume.

B. The sump shall be completely filled with marble chips, and furnished complete with gasketed, bolted polyethylene cover.

2.12 SEWAGE EJECTOR

A. Provide in accordance with Section 22 14 29 - Sump Pumps.

2.13 INTERCEPTORS AND TANKS

A. Interceptors:

1. Interceptors shall be of epoxy-coated, cathodic-protected, steel of double wall construction with hydrostatic or dry well leak detector in annulus or waterproofed

concrete with minimum of two compartments. Provide three 24-inch minimum diameter manholes with removable covers designed for TXDOT H 20 traffic loads.

2. Provide floating type light oil and fuel skimmer in each interceptor with gravity drain to waste oil tank; 3 inches diameter minimum; 1/2 inch per foot slope. Skimmer buoyancy shall be adjustable to allow skimming 0.90 to 0.94 specific gravity floating material.

3. The manholes shall be located at interceptor ends for access to each compartment and centered over compartment partition for access to skimmer. Provide a plumbing vent terminating minimum of 10 feet above grade for each interceptor.

4. The leak detector for double wall steel interceptors shall be located in the Mechanical or Electrical Room, as applicable, and a leak alarm shall be transmitted to Central as indicated on the Contract Drawings.

B. Tanks:

1. Tanks shall be of glass fiber-reinforced polyester plastic conforming with ASTM D4021. Tanks shall be equipped with 22 inches minimum inside diameter manway with bolted and gasketed cover, 36 inches minimum diameter by 36 inches minimum high compartment above, and 24 inches diameter heavy duty traffic pattern manhole cover at grade.

2. Tanks shall be furnished complete with 2 inches vent, terminating a minimum 10 feet above grade; 3 inches capped pump out connection with spill containment box with traffic pattern cover at grade, and level gage with remote dial indicator and high level alarm installed in the Mechanical or Electrical Room, as applicable. Tanks shall be of double wall construction with hydrostatic type leak detector or enclosed in concrete vault with floor mounted moisture type detector.
3. The leak detection panel, level gage, and high level alarm shall be located in the Mechanical or Electrical Room, as applicable, and alarms shall be transmitted to Central as indicated on the Contract Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Excavations shall be free of water and extraneous material immediately before sanitary sewerage products are installed or placed. Bottoms of trenches shall have a 6 inch sand bed and shall be formed to support the bottom quadrant of the pipe and fittings. Should rock be encountered or should bedding material be unsuitable to support the products at indicated elevation, continue excavation to an elevation 8 inches below the indicated elevation and backfill with clean sand to the indicated elevation.

B. Interior of pipe, pipe fittings, valves, drains, and cleanouts shall be cleaned of dirt and foreign substances before installation.

C. Install sleeves through walls, floors, roofs, and other structures before sewerage lines are installed. Piping shall not be installed under walls, foundations, or footings. Invert of sleeves shall be minimum 6 inches above the bottom of footings and foundations.

3.02 INSTALLATION

A. Excavating and backfilling, including bedding and compacting requirements, shall conform to Section 33 05 28 - Trenching and Backfilling for Utilities.

B. Install products where indicated. Remove and reinstall products that are disturbed after installation. Ends of products to which future connections will be made shall be valved, plugged, or capped, and anchored.

C. Connections to existing facilities shall be made with fittings and short bends to suit the actual conditions; connect products in accordance with the product manufacturer's printed installation instructions.

D. Pipe and fittings shall be set true to line and grade before joints are made up. Angular deflections of joints shall not exceed the recommendations of the pipe and fitting manufacturer. Should the alignment require deflection of joints to be in excess of those recommended, use special bends to achieve the indicated deflection. Pipe ends and joints shall be prepared in accordance with the manufacturer's recommendations. As a minimum pipe ends shall be sanded and cleaned, fittings shall be cleaned, and solvent shall be applied to both pipe and fittings.

E. Slope horizontal soil and waste pipes a minimum 2% downward in direction of flow. Extend main vertical soil and waste stacks full size to the roof-line and above as vents, except where otherwise specifically indicated. Run vent pipes in roof spaces as close as possible to the underside of the roof without forming traps in pipe, using fittings as required. If a circuit vent pipe from fixture, or line of fixtures, will be connected to a vent line serving other fixtures, the connection shall be at least 6 inches above the flood- level of the highest fixture served. Grade and connect vent and branch-vent pipes to drip back to the vertical stack by gravity. Support all above grade piping in accordance with 15065, Pipe Sleeves, Supports, and Anchors.

F. Install wall sleeves and seals in accordance with 15065, Pipe Sleeves, Supports, and Anchors. Sealing members shall be installed so as to provide electrical isolation between the metallic carrier pipe and all metallic components of the sleeve and seal.

G. Make changes in pipe size on soil, waste, and drain lines with reducing fittings. Changes in direction shall be with either 45-degree wyes long or short-sweep 1/4, 1/6, 1/8 or 1/16 bends, or elbows.

H. Slip joints will be permitted only in fixture trap seals on the inlet side of the traps.

I. Installation of pipe and fittings shall comply with the manufacturers' recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted.

J. Joints in no hub cast iron soil pipe and fittings shall use double-seal, compression-type molded neoprene gasket, which shall provide a positive seal.

K. Tighten band and screw assemblies used in conjunction with hubless type cast iron pipe to 60- inch pounds torque on each band screw, with a torque wrench specifically designed for the purpose.

L. Provide escutcheons at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, and ceilings. Fasten escutcheons to pipe or pipe covering.

M. Equip each fixture and piece of equipment connecting to the sanitary sewer system with a drain trap located as near fixture as possible, and no fixture shall be double-trapped.

N. Provide acid-proof piping in locations indicated. Install acid-proof piping separate from other waste piping, and connect to neutralizing sump, then to other sanitary piping only at mains.

O. Drains:

1. Floor drain rim elevation shall be located such that uniform slope of 1-1/2 percent is maintained from the furthest distance at the perimeter of slab to rim. There shall be no local depression.

2. Unless otherwise indicated, floor, shower, and trench drains connected to sanitary sewers shall be trapped.

3. All below grade traps in public restrooms shall be provided with trap primers.

4. Maintain integrity of waterproof membranes where penetrated by installing flashing collar or flange so that no leakage occurs between drain and adjoining materials.

5. Position drains and neutralizing sumps so that they are readily accessible and easy to maintain.

P. Provide access panels in accordance with Section 20 10 13 - Common Materials and Methods for Facility Services – Fire Suppression, Plumbing and HVAC.

Q. Interceptor and Tank Installation: Manhole covers shall be set with frame in reinforced concrete collar 48 inches minimum wide by 6 inches thick with No. 4 reinforcement 12 inches each way and finished flush with grade. Storage tanks shall be installed with antiflotation slab and tie downs in accordance with the manufacturer's instructions. Interceptors shall be installed on redwood sleepers or antiflotation slab in accordance manufacturer's instructions. Both storage tanks and interceptors shall have compacted pea gravel backfill installed to grade in accordance with the manufacturer's instructions.

3.03 PIPE CLEANOUTS

A. Cleanouts shall be the same size as the pipe up to and including 4 inches; for 6 inch and larger pipe, cleanouts shall be 4-inch minimum. Cleanouts for drainage pipe shall consist of a longsweep 1/4 bend or one or two 1/8 bends extended to the place indicated. Wall or accessible piping cleanouts shall be T-pattern, 90-degree branch drainage fittings having screw plugs. Cleanouts shall be provided at the base of each riser and shall consist of a wye pattern fitting with a screw plug.

3.04 IDENTIFICATION

A. Identification shall be as specified in Section 20 40 13 - Identification for Facility Services.

3.05 FIELD QUALITY CONTROL

A. Do not cover products to be buried and do not paint products or line segments to be painted until those products have been inspected, tested, and accepted.

B. Test installed sewerage lines and equipment, with the Engineer in attendance, as follows:

1. Fill gravity sewers and soil pipe with water and allow to stand for not less than 30 minutes without leaking; low and intermediate branches shall have been temporarily sealed. Provide test tees having cast iron screwed plugs in the vertical stacks if the sewers and soil pipe are to be tested in sections. Accomplish testing of interior lines before lines are concealed. Repair leaks and retest systems until the system exhibits no leaks. Head of water shall be not less than 5 feet, and shall not exceed 10 feet.

2. Disconnect force mains from equipment, seal open ends, and fill mains with water, and hydrostatically test to a pressure of 50 psi greater than the normal pumping pressure. Maintain test pressure until the force main system has been examined for leaks. Repair leaks and retest system until no leaks are exhibited. Use testing instruments calibrated by a qualified laboratory in accordance with Section 01 45 00 - Quality Control.

3. Test equipment by operation and adjustment of controls. Faulty equipment or controls shall be either repaired or replaced.

3.06 PAINTING

A. Except where indicated, piping systems shall not be painted. Where pipes are indicated to be painted, as exposed piping in finished rooms, prepare pipe and paint in accordance with Section 09 91 00 - Painting.

3.07 CLEANING

A. Cleaning of installed products shall consist of removing dirt and foreign material from

the surfaces of products. Manufacturer's labels shall remain intact. Rust stained products shall either be replaced or recoated with paint, which is compatible with factory-applied coating.

3.08 REPAIR

A. Repair pipe coatings, which have become damaged during installation of pipe. Rust stained cast iron pipe and fittings shall either be replaced or recoated with paint, which is compatible with factory-applied coating.

END OF SECTION 22 13 01

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

B. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type withrough-brass finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 19

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Liquid-in-glass thermometers.
2. Thermowells.
3. Test plugs.

B. Related Sections:

1. Section 221116 "Domestic Water Piping" for water meters inside the building.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings> or comparable product by one of the following:

a. Trerice, H. O. Co.
b. Approved equal.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Straight unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue[or red] organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.

a. Design for Thermowell Installation: Bare stem.

9. Connector: 3/4 inch, with ASME B1.1 screw threads.

10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 TEST PLUGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Flow Design, Inc.
2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
3. Weiss Instruments, Inc.
4. Approved equal.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each domestic water chiller.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.2 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.3 THERMOMETER SCHEDULE

A. Thermometers at outlet of each domestic water heater shall be the following:

1. Compact-style, liquid-in-glass type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Hot-Water Piping: 0 to 200 deg F.

END OF SECTION

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

Section Includes:
1. Brass ball valves.
2. Bronze swing check valves.
3. Bronze globe valves.

B. Related Sections:

1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.
3. Section 221319 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valve-End Connections:
1. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:

a. Apollo Valves.
b. NIBCO INC.
c. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 150 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.4 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. NIBCO INC.
.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 150 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron[, bronze, or aluminum].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Fastener systems.
5. Pipe stands.
6. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
2. Standard: MFMA-4.
3. Channels: Continuous slotted steel channel with inturned lips.
4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
6. Paint Coating: Vinyl or Acrylic.
7. Plastic Coating: Polyurethane or Epoxy.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4.
3. Channels: Continuous slotted steel channel with inturned lips.
4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
6. Coating: Zinc or Paint.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit for roof installation without membrane penetration.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

3. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use copper-plated pipe hangers and attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

M. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch, or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 in).
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inc) for viewing distances up to 72 inche), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Locate pipe labels and flow arrows where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and equipment connections. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:

   a. Background Color: White.
   b. Letter Color: Blue

2. Domestic Hot Water Piping:

   a. Background Color: White.
   b. Letter Color: Red

3. Domestic Hot Water Return Piping:

   a. Background Color: White.
   b. Letter Color: Green

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except valves within factory-fabricated equipment units; faucets and plumbing fixture connections. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches, round.
   b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Green.

3. Letter Color:

   a. Cold Water: White
   b. Hot Water: White

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic re-circulating hot-water piping.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.

4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,

1. Description: Manufactured plastic wraps for covering plumbing fixture hot and coldwater supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,

1. Description: Manufactured plastic enclosure for covering plumbing fixture hot and coldwater supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces

with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
6. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

NPS 1-1/4 and Smaller: Insulation shall be one on the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

E. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys.

B. Flux: ASTM B 813, water flushable.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F, 150 psig, 250 psig.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Exposed piping on roof shall be copper tubing and fittings.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

4. NPS 2-1/2: 108 inches with 1/2-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allowed to stand for 24 hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.
    e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Aboveground domestic water piping, NPS 2 and smaller shall be the following:

1. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M wrought copper, solder-joint fittings; and soldered joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 8 , shall be the following:

1. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type wrought copper, solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use full port ball valves for piping NPS 2 and smaller. Use butterfly or ball, with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated or Memory-stop balancing valves.
4. Drain Duty: Ball Valve with Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Temperature-actuated, water mixing valves.
5. Outlet boxes.
6. Hose bibbs.
7. Water-hammer arresters.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Conbraco Industries, Inc.
b. MIFAB, Inc.
c. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
d. Woodford Manufacturing Company; a division of WCM Industries, Inc.
e. Zurn Industries, LLC; Plumbing Products Group.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Conbraco Industries, Inc.
b. FEBCO; a division of Watts Water Technologies, Inc.
c. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. Accessories:

a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies

1. Manufacturers: Subject to compliance with requirements, provide products by the following

a. Conbraco Industries, Inc.
b. FEBCO; a division of Watts Water Technologies, Inc.
c. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. Accessories:

a. ValvesNPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
b. ValvesNPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Symmons Industries, Inc.
b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
c. Powers Hydroguard.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig min.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Rough bronze.

2.6 HOSE BIBBS

A. Hose Bibbs :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. J. R. Smith.
b. Watts Drainage Products.
c. Approved Equal.

2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.

4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Chrome or nickel plated.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Operating key.
14. Operation for Finished Rooms: Operating key.
15. Include operating key with each operating-key hose bibb.
16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.7 HOSE BIBBS (EXTERIOR)

A. Non-freeze Wall Hose Bibbs :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. J. R. Smith.
    b. Watts Drainage Products.
    c. Approved Equal.

2. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4.
7. Nozzle and Wall-Plate Finish: Polished nickel bronze.
8. Operating Keys(s): One with each wall hydrant.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. AMTROL, Inc.
    b. Tyler Pipe; Wade Div.
    c. Watts Drainage Products.
    d. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

E. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve and pump.

F. Install water-hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 11 23

DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

PART 2 - PRODUCTS

2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bell & Gossett Domestic Pump; ITT Corporation.
2. Grundfos Pumps Corp.
3. Approved Equal.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed, unless otherwise indicated.

2.2 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F (18 to 93 deg C).
3. Enclosure: NEMA 1.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 v, AC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install thermostats in hot-water return piping.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."

D. Connect thermostats to pumps that they control as specified.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Adjust temperature settings on thermostats.

3.6 ADJUSTING

A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 150-foot head of water.
2. Waste, Force-Main Piping: 150 psig.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than five days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

B. Verify condition of existing waste and vent piping for continued use. Examine and check all waste and vent piping for impaction, corrosion or failure:

1. Provide an internal pipe camera inspection and assessment report to the owner of all vent piping and waste sewer piping 3 inches or larger. Document on a set of building construction drawings the location of problems or issues discovered.
2. Notify owner of any locations where quality of existing piping is in a condition of failure and provide estimate of cost to remediate condition.
3. Router and clean any corroded or impacted waste and vent piping and bring to a condition of good working serviceability. Notify owner of and issues or locations where existing piping is found to be in unacceptable condition.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and CISPI 310.
2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Galvanized or Cast-Iron Drainage Fittings: ASME B16.12, threaded.

C. Steel Pipe Pressure Fittings:

1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1173.
    b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Pressure Transition Couplings:

    a. Standard: AWWA C219.
    b. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
    c. Center-Sleeve Material: Manufacturer's standard.
    d. Gasket Material: Natural or synthetic rubber.
    e. Metal Component Finish: Corrosion-resistant coating or material.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

    a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    b. NPS 2 and Larger: Pressure transition couplings.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch w. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

3.7 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.8 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Galvanized-steel pipe, drainage fittings, and threaded joints.

B. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Galvanized-steel pipe, drainage fittings, and threaded joints.

C. Underground, soil, waste, and vent piping NPS 4 and smaller shall be of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI cast-iron hubless-piping couplings; and coupled joints.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.
4. Flashing materials.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the products covered in this specification:

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

      1) Josam Company.
      2) MIFAB, Inc.
      3) Smith, Jay R. Mfg. Co.
      4) Zurn Plumbing Products Group.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts (Foot Traffic):

1. ASME A112.36.2M, Cast-Iron Cleanouts:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

      1) Josam Company.
      2) Sioux Chief Manufacturing Co., Inc.
      3) Smith, Jay R. Mfg. Co.
      4) Tyler Pipe.
      5) Watts Drainage Products.
      6) Zurn Plumbing Products Group.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Inside calk.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with set-screws or other device.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy

11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.

C. Cast-Iron Wall Cleanouts:
1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

a. Josam Company.
b. Smith, Jay R. Mfg. Co.
c. Tyler Pipe; Wade Div.
d. Zurn Plumbing Products Group.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Raised head plug with countersunk taper threaded bronze plug.
6. Closure Plug Size: Same as cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel] cover plate with screw.

2.2 FLOOR DRAINS

A. Floor Drains:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.
c. Zurn Plumbing Products Group;

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Cast iron, flanges.
5. Seepage Openings: Required.
6. Flashing Clamp: Required.
7. Outlet: Bottom.
8. Coating on Interior and Exposed Exterior Surfaces: Not required.
9. Sediment Bucket: Required.
10. Grate Material: Nickel bronze.
11. Top Shape: Round.
12. Dimensions of Top or Strainer: 8 1/2” diameter top with 3 3/4” deep body and 1 1/2” deep slotted sediment bucket.
13. Top Loading Classification: Medium Duty.
14. Funnel: As required or indicated on plans.
15. Trap Features: Sure-Seal waterless trap primer

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top

of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

B. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

C. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor. Floor drains in parking area and driveways shall be “traffic” rated.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

F. Assemble FRP channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

I. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

J. Install deep-seal traps on floor drains and other waste outlets, if indicated.

K. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

L. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

N. Install vent caps on each vent pipe passing through roof.

O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

P. Install wood-blocking reinforcement for wall-mounting-type specialties.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 33 00

ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, light-duty, storage, electric, domestic-water heaters.
2. Flow-Control, Electric, Tankless, Domestic-Water Heaters.
3. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, efficiency, operating characteristics, electrical characteristics, and furnished specialties and accessories, warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: Three years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, domestic-WATER HEATERS

A. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Bradford White Corporation.
b. Rheem Manufacturing Company.
c. A. O. Smith Corporation.
d. State Industries.

3. Standard: UL 174.
4. Storage-Tank Construction: Steel, vertical arrangement.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

5. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1.
e. Jacket: Steel with enameled finish.
f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
h. Temperature Control: Adjustable thermostat.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Chronomite Laboratories, Inc.
b. Eemax, Inc.
c. Approved Equal.

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

a. Connections: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig.
c. Heating Element: Resistance heating system.
d. Temperature Control: Flow-control fitting.
e. Safety Control: High-temperature-limit cutoff device or system.
f. Jacket: Aluminum or steel with enameled finish or plastic.

4. Support: Bracket for wall mounting.
5. Capacity and Characteristics:

a. Refer to plumbing equipment schedules for sizing and electrical characteristics.

2.3 DOMISTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. AMTROL Inc.
b. Taco, Inc.
c. Approved Equal.

2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Air-Charging Valve: Factory installed.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

D. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base.

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Install commercial, electric, domestic-water heaters with seismic-restraint devices.

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Fill electric, domestic-water heaters with water.

J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and residential, electric, domestic-water heaters.

END OF SECTION

SECTION 22 42 13

COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Waterclosets.
2. Urinals
3. Lavatories.
4. Kitchen sinks.
5. Sinks
6. Mop Sinks
7. Electric Drinking Fountains
8. Garbage Disposals
9. Thermostatic Tempering Valves

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Sample Warranty

1.4 CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: For plumbing fixtures and faucets to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer-Tank Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than two of each type.
4. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 WATERCLOSETS

A. WC-1, Floor Mounted Tank Type (AS SCHEDULED)

1. Supply: Watts 5/8” x 3/8” OD chrome plated loose key quarter turn ball valve style angle stop with 12” flexible riser tube and escutcheon.

2. Seat: American Standard elongated, heavy duty white open front seat and antimicrobial surface. No cover.

B. WC-2, Floor Mounted Tank Type (ADA Compliant) (AS SCHEDULED)

1. Supply: Watts 5/8” x 3/8” OD chrome plated loose key quarter turn ball valve style angle stop with 12” flexible riser tube and escutcheon.

2. Seat: American Standard elongated, heavy duty white open front seat and antimicrobial surface. No cover.

2.2 URINALS

A. UR-1 Urinal (AS SCHEDULED)

1. Carrier: Watts Drainage CA-321 floor mounted urinal carrier with heavy gauge steel offset uprights with welded feet, universal steel hanger support plate and bottom bearing plate with integral mounting brackets, and plated hardware.

2.3 LAVATORIES

A. LAV-1, Counter Top Lavatory (ADA Compliant)

1. Fixture: AS SCHEDULED.

2. Supply Fitting: Unit shall have cast brass 4” centerset with temperature limit stop to adjust outlet temperature and time limit stop to adjust flow time. Includes (2) in-line check/screen assemblies. Spray outlet with 0.5 gpm flow rate. Vandal resistant.

3. Drain: Watts 629-203C cast brass drain with integral perforated grid and 1-1/4” x 6” tail-piece.

4. Supplies: Watts BV894016K 5/8” x 3/8” OD chrome plated loose key quarter turn ball valve style angle stops with 16” flexible riser tubes and escutcheons.

5. Trap: Watts 519-173R 17 gauge 1-1/4" x 1-1/2" semi-cast brass P-trap with cleanout.

B. L-2, Wall Hung Lavatory (ADA Compliant)

1. Fixture: AS SCHEDULE

2. Supply Fitting: Unit shall have cast brass 4” centerset with temperature limit stop to adjust outlet temperature and time limit stop to adjust flow time. Includes (2) in-line check/screen assemblies. Spray outlet with 0.5 gpm flow rate. Vandal resistant.

3. Drain: Watts 629-203C cast brass drain with integral perforated grid and 1-1/4” x 6” tailpiece.

4. Supplies: Watts BV894016K 5/8” x 3/8” OD chrome plated loose key quarter turn ball valve style angle stops with 16” flexible riser tubes and escutcheons.

5. Trap: Watts 519-173R 17 gauge 1-1/4" x 1-1/2" semi-cast brass P-trap with cleanout.

6. Carrier: Watts Drainage CA-411 floor mounted concealed arm lavatory carrier with heavy gauge steel uprights with integral welded feet, acid resistant epoxy coated cast iron concealed arms with leveling screws and basin locking device, upper tie rod and plated hardware.

C. S-1, One Compartment Sink

1. Fixture: AS SCHEDULED.

2. Trap: 1 1/2” x 2” cast brass chrome plated p-trap with cleanout.

3. Drain: “Elkay” LK35, stainless steel body with conical strainer basket with flex stem and rubber stopper.

4. Supplies: 3/8 angle supply with wheel handle stop.

D. S-2, Three Compartment Sink

1. Fixture: BY OTHER.

2. Trap: 1 1/2” x 2” cast brass chrome plated p-trap with cleanout.

3. Drain: “Elkay” LK35, stainless steel body with conical strainer basket with flex stem and rubber stopper.

4. Supplies: 3/8 angle supply with wheel handle stop.

E. MS-1, Mop Sink

1. Fixture: AS SCHEDULED.

F. GD-1 Garbage Disposal (BY OTHER)

G. EWC-1, Hi/Lo Electric Drinking Fountain (ADA Compliant)

1. Fixture: AS SCHEDULED.

2. Compressor: 1/5 HP, 120 volt, hermetically sealed, with capacitor and overload protection. Manufacturer shall provide five-year, 100% replacement warranty on the compressor, controls, tank and integral piping.

3. Trap: 1 1/2” x 1 1/2” cast brass chrome plated p-trap with cleanout.

4. Supplies: 3/8 angle supply with wheel handle stop.

H. TMV- 1 Thermostatic Tempering Valve

1. Fixture: AS SCHEDULED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.

B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install shower flow-control fittings with specified maximum flow rates in shower arms.

J. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

L. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Connect inlet hose to dishwasher and outlet hose to disposer.

M. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.

N. Set shower receptors in leveling bed of cement grout.

O. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

P. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

Q. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224713

DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes drinking fountains and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of drinking fountain.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains Stainless steel, wall mounted, semirecessed and recessed (ADA compliant).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.
d. Approved Equal.

2. Model designation: As designated in fixture schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set pedestal drinking fountains on floor.

C. Install recessed drinking fountains secured to wood blocking in wall construction.

D. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Metal framing systems.
3. Fastener systems.
4. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cooper B-Line, Inc.
   b. Flex-Strut Inc.
   c. Unistrut Corporation.
   d. Approved Equal.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
7. Metallic Coating: Electroplated zinc or Hot-dipped galvanized.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports or metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 10.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. C-Clamps (MSS Type 23): For structural shapes.
4. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
5. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

6. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
7. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

END OF SECTION

SECTION 230548

VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Housed-spring isolators.
4. Restrained-spring isolators.
5. Elastomeric hangers.
6. Spring hangers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. California Dynamics Corporation.
b. Isolation Technology, Inc.
c. Mason Industries, Inc.
d. Vibro-Acoustics
e. Or Approved Equal.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Cork.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. California Dynamics Corporation.
b. Isolation Technology, Inc.
c. Mason Industries, Inc.
d. Vibro-Acoustics
e. Or Approved Equal.

2. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. California Dynamics Corporation.
    b. Isolation Technology, Inc.
    c. Mason Industries, Inc.
    d. Vibro-Acoustics
    e. Or Approved Equal.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top housing with appropriate attachment and leveling device and elastomeric pad.

2.4 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. California Dynamics Corporation.
    b. Isolation Technology, Inc.
    c. Mason Industries, Inc.
    d. Vibro-Acoustics
    e. Or Approved Equal.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

    a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top plate with threaded mounting holes and elastomeric pad.
    c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.5 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. California Dynamics Corporation.
   b. Isolation Technology, Inc.
   c. Mason Industries, Inc.
   d. Vibro-Acoustics
   e. Or Approved Equal.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.6 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. California Dynamics Corporation.
   b. Isolation Technology, Inc.
   c. Mason Industries, Inc.
   d. Vibro-Acoustics
   e. Or Approved Equal.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe Labels

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering

for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Gas Piping: 2 psi pressure piping

a. Background Color: Yellow.
b. Letter Color: Black.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 15 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports.

C. Sample report forms.

D. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Check dampers for proper position to achieve desired airflow path.

F. Check for airflow blockages.

G. Check condensate drains for proper connections and functioning.

H. Check for proper sealing of air-handling-unit components.

I. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent
2. Air Outlets and Inlets: Plus or minus 10 percent

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Balancing stations.
4. Position of balancing devices.

E. Fan Coil Unit Test Reports: For fan coil units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches.

j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Cooling-coil static-pressure differential in inches wg.
f. Outdoor airflow in cfm.
g. Return airflow in cfm.
h. Outdoor-air damper position.
i. Return-air damper position.

4. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Refrigerant expansion valve and refrigerant types.
i. Refrigerant suction pressure in psig.
j. Refrigerant suction temperature in deg F.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.

d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 INSPECTIONS

A. Final Inspection:

1. After testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect and Construction Manager.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect and Construction Manager.
3. Architect and Construction Manager may randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

B. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Refrigerant suction piping, indoors and outdoors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

1.5 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," and "Outdoor, Aboveground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
d. Approved Equal.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 SEALANTS

A. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 TAPES

A. Ethylene/propylene rubber-based, 30-mil tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Flexible Elastomeric Insulation may be installed as part of a combined refrigeration line-set system as long as insulation thickness meets the requirements of local codes in the jurisdiction having authority.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
3. Seal jacket to wall flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.6 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric Insulation 3/8 inch thick.

B. Refrigerant Suction Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric Insulation: 1/2 inch thick.

3.7 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric Insulation: 1/2 inches thick. Apply UV protective coating to insulation or provide UV rated Flexible Elastomeric Insulation.

END OF SECTION

SECTION 23 09 00
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1: GENERAL

1.1 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Communications with Third Party Equipment:
   1. Any additional integral control systems included with the products integrated with the work of this section shall be furnished with a BACnet interface for integration into the Direct Digital Control System described in this section.

1.4 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
B. The following sections constitute related work:
   1. Section 01 30 00 - Administrative Requirements
   2. Section 01 60 00 - Product Requirements

1.5 DESCRIPTION

A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
B. The system shall directly control HVAC equipment as specified in Section– Sequence of Operations for HVAC Controls. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of setpoints as specified in the sequence.
C. Provide for future system expansion to include monitoring of occupant card access, fire alarm, and lighting control systems.
D. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends, and alarms specified in Section – "Sequence of Operations for HVAC Controls" shall be BACnet objects.

1.6 APPROVED CONTROL SYSTEMS

A. The following are approved control system suppliers, manufacturers, and product lines:

   1. Delta Controls, Automated Logic, Alerton, Honeywell or approved equal.

B. The above list does not indicate order of preference. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.

1. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer and product line unless Owner approves use of multiple manufacturers.
2. Other products specified herein (such as sensors, valves, etc.) need not be manufactured by the above manufacturers.

1.7 QUALITY ASSURANCE

A. Installer and Manufacturer Qualifications
    1. Installer shall have an established working relationship with Control System Manufacturer.
    2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

1.8 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:
    1. National Electric Code (NEC)
    2. International Building Code (IBC)
        a. Section 719 Ducts and Air Transfer Openings
        b. Section 907 Fire Alarm and Detection Systems
        c. Chapter 28 Mechanical
    3. International Mechanical Code (IMC)
    4. ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACNET)

1.9 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).
    1. Graphic Display. A graphic with 20 dynamic points shall display with current data within seconds.
    2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within seconds. and shall automatically refresh.
    3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh.
    4. Object Command. Devices shall react to command of a binary object within 5 sec. Devices shall begin reacting to command of an analog object within 5 sec.
    5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 30 sec.
    6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 10 sec. Select execution times consistent with the mechanical process under control.
    7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
    8. Multiple Alarm Annunciations. Each workstation on the network shall receive alarms within 5 sec of other workstations.
    9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

TABLE 1
REPORTING ACCURACY

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15ºC (±0.25ºF)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm

Note 1: Accuracy applies to 10% - 100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

TABLE 2
CONTROL STABILITY AND ACCURACY

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

1.10 SUBMITTALS

A. Product Submittal Requirements: Meet requirements of Section 01 30 00 on Shop Drawings, Product Data, and Samples. Provide six copies of shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Begin no work until submittals have been approved for conformity with design intent. Provide drawings as

AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 3 prints of each drawing on 11" x 17" paper. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Provide submittals within 12 weeks of contract award on the following:

1. Direct Digital Control System Hardware
    a. Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
    b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
        i. Direct digital controllers (controller panels)
        ii. Transducers and transmitters
        iii. Sensors (include accuracy data)
        iv. Actuators
        v. Valves
        vi. Relays and switches
        vii. Control panels
        viii. Power supplies
        ix. Batteries
        x. Operator interface equipment
        xi. Wiring
    c. Wiring diagrams and layouts for each control panel. Show termination numbers.
    d. Floor plan schematic diagrams indicating field sensor and controller locations.
    e. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Central System Hardware and Software
    a. Complete bill of material indicating quantity, manufacturer, model number, and relevant technical data of equipment used.
    b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
        i. Central Processing Unit (CPU) or web server
        ii. Monitors
        iii. Keyboards
        iv. Power supplies
        v. Battery backups
        vi. Interface equipment between CPU or server and control panels
        vii. Operating System software
        viii. Operator interface software
        ix. Color graphic software
        x. Third-party software
    c. Schematic diagrams of control, communication, and power wiring for central system installation. Show interface wiring to control system.
    d. Network riser diagrams of wiring between central control unit and control panels.
3. Controlled Systems
    a. Riser diagrams showing control network layout, communication protocol, and wire types.

b. Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.
c. Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
d. Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
e. Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system. List I/O points and software points specified in Section 23 09 93. Indicate alarmed and trended points.

4. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

B. Schedules
1. Schedule of work provided within one month of contract award, indicating:
a. Intended sequence of work items
b. Start date of each work item
c. Duration of each work item
d. Planned delivery dates for ordered material and equipment and expected lead times
e. Milestones indicating possible restraints on work by other trades or situations
2. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

C. Project Record Documents. Submit three copies of record (as-built) documents upon completion of installation for approval prior to final completion. Submittal shall consist of:
1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 6 prints of each drawing on 11" x 17" paper.
2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 23 09 23 Article 3.16 (Control System Demonstration and Acceptance).
3. Operation and Maintenance (O&M) Manual. Printed, electronic, or online help documentation of the following:
a. As-built versions of submittal product data.
b. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
c. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
d. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
e. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
f. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
g. Graphic files, programs, and database on magnetic or optical media.
h. List of recommended spare parts with part numbers and suppliers.

i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
j. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
k. Licenses, guarantees, and warranty documents for equipment and systems.
l. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.11 WARRANTY

A. Warrant work as follows:
1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
3. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.12 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
1. Graphics
2. Record drawings
3. Database
4. Application programming code
5. Documentation

PART 2: PRODUCTS

2.1 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
B. Install new wiring and network devices as required to provide a complete and workable control network. Project drawings indicate remote buildings or sites to be connected by a nominal 56,000 baud modem over voice-grade telephone lines. In each remote location a modem and field device connection shall allow communication with each controller on the internetwork as specified in Paragraph D.
C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
    1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
    2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 23 09 93. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.
F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.
G. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization (WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
    1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
    2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
    3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
    4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

2.3 OPERATOR INTERFACE

A. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA). This secondary interface may be text-based and shall provide a summary of the most important data. As a minimum, the following capabilities shall be provided through this interface:
   1. An operator authentication system that requires an operator to log in before viewing or editing any data, and which can be configured to limit the privileges of an individual operator.
   2. The ability to view and acknowledge any alarm in the system. Alarms or links to alarms shall be provided on a contiguous list so the operator can quickly view all alarms.
   3. A summary page or pages for each piece of equipment in the system. This page shall include the current values of all critical I/O points and shall allow the operator to lock binary points on or off and to lock analog points to any value within their range.
   4. Navigation links that allow the operator to quickly navigate from the home screen to any piece of equipment in the system, and then return to the home screen. These links may be arranged in a hierarchical fashion, such as navigating from the home screen to a particular building, then to a specific floor in the building, and then to a specific room or piece of equipment.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.

C. Hardware. Each workstation or web server shall consist of the following:
   1. Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications. Hard disk shall have sufficient memory to store system software, one year of data for trended points, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance. Web server or workstations shall be IBM-compatible PCs with a minimum of:
      a. Intel Core 2 Duo 3 GHz processor
      b. 2 GB RAM
      c. 250 GB hard disk providing data at 100 MB/sec
      d. 16x CD-RW/DVD drive
      e. Serial, parallel, and network communication ports and cables required for proper system operation
   2. Modem. Auto-dial modem and associated cables shall transmit over voice-grade telephone lines at a nominal 56,000 baud and shall provide communication between workstation or web server and remote buildings and workstations.

D. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:
   1. Log In and Log Out. System shall require user name and password to log in to operator interface.
   2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.
   3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.
6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.
7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.
9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

E. System Software.
1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Windows 8, Microsoft Windows 7, Vista, Windows XP, Server 2008 or >, Pro, Red Hat Linux, or Sun Solaris.
2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
    a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
    b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
    c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
    d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).

F. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.
1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
3. System Configuration. Operators shall be able to configure the system.
4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.
5. Security. System shall require a user name and password to view, edit, add, or delete data.
    a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object. Authorized operators shall be able to vary and deny each operator's accessible functions based on equipment or geographic location.
    b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
    c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.
6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.
11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Trends shall be BACnet trend objects.
12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:
    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
        i. Alarm History

ii. Trend Data. Operator shall be able to select trends to be logged.
iii. Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Energy Reports. System shall include an easily configured energy reporting tool that provides the capabilities described in this section.
    a. The energy reporting tool shall be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BAS.
    b. The energy reporting tool shall be preconfigured by the Contractor to gather and store energy demand and consumption data from each energy source that provides metered data to the BAS. Meter data shall be stored at 5 minute intervals unless otherwise specified. This data shall be maintained in an industry standard SQL database for a period of not less than five years.
    c. The energy reporting tool shall allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and shall provide options to view the data in a table, line graph, bar graph, or pie chart. The tool shall also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.
    d. The energy reporting tool shall allow the operator to select an energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool shall also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.
    e. The energy reporting tool shall allow the operator to easily generate the previously described graphs "on the fly," and shall provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool shall also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports shall be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.
    f. The energy reporting tool shall be capable of collecting and displaying data from the following types of meters:
        i. Electricity
        ii. Gas
        iii. Oil
        iv. Steam
        v. Chilled Water
        vi. Potable Water
        vii. Heating and cooling degree days. (May be calculated from sensor data rather than metered.)
    g. The user shall have the option of using Kw (Kwh) or Btu/hr (Btu) as the units for demand and consumption reports. Multiples of these units (MWH, kBtu, etc.) shall be used as appropriate. All selected sources shall be automatically converted to the selected units. The user shall similarly have the option of entering facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.

h. The user shall have the option of entering benchmark data for an individual facility or a group of facilities.
i. The user shall have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:
i. Low/High/Average value of the metered value being displayed.
ii. Heating and/or Cooling Degree Days for the time period(s) being displayed.

16. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
17. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.
18. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.
19. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
a. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
b. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
c. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
d. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
e. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
f. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.
i. Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
ii. System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be

able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

G. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.
H. Operator Workstation: Web server or workstation shall conform to BACnet Operator Workstation (B-OWS) device profile or BACnet Advanced Workstation (B-AWS) as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-OWS or B-AWS in the BACnet Testing Laboratories (BTL) Product Listing.

2.4 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.
B. System Security. See Paragraph 2.3.F.5 (Security) and Paragraph 2.3.F.15.c (Operator Activity).
C. Scheduling. See Paragraph 2.3.D.4 (View and Adjust Operating Schedules). System shall provide the following schedule options as a minimum:
    1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
    2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.
    3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.
D. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
E. Binary and Analog Alarms. See Paragraph 2.3.F.7 (Alarm Processing).
F. Alarm Reporting. See Paragraph 2.3.F.9 (Alarm Reactions).
G. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.
H. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.
I. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.
J. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
K. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.
L. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.
M. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Section 23 09 93 – Sequence of Operations for HVAC Controls.

2.5 CONTROLLERS

A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

B. BACnet.
    1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
    2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
    3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
    4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
    5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
    6. BACnet Communication.
        a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
        b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
        c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
        d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
        e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
        f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication.
    1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
    2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
    3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
    4. Stand-Alone Operation. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
    1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
    2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.
F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.
G. Serviceability.
    1. Controllers shall have diagnostic LEDs for power, communication, and processor.
    2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
    3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
H. Memory.
    1. Controller memory shall support operating system, database, and programming requirements.
    2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
    3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
I. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.6 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.
C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.
D. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
E. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
F. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
G. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

H. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.7 AUXILIARY CONTROL DEVICES

A. Binary Temperature Devices.
   1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
   2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
   3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

B. Temperature Sensors.
   1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
   2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m^2(10 ft^2) of duct cross-section.
   3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
   4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
   5. Differential Sensors. Provide matched sensors for differential temperature measurement.

C. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).
   1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.
   2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

D. Relays.
   1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
   2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

E. Override Timers.
   1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

F. Current Transmitters.

1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation on existing wiring.

G. Current Transformers.
1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

H. Voltage Transmitters.
1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.
2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

I. Voltage Transformers.
1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

J. Power Monitors.
1. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.
2. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

K. Current Switches.
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

L. Local Control Panels.
1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.
2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.
3. Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2. WIRING AND RACEWAYS

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.

B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

PART 3: EXECUTION

3.1 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.
B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.
C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate work with work of others. Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.2 PROTECTION

A. Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.
B. Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site.
    1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.
    2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.
B. Test and Balance.
    1. Provide Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing.
    2. Train Test and Balance Contractor to use control system interface tools.
    3. Provide a qualified technician to assist with testing and balancing the first 20 terminal units.
    4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.
C. Life Safety.
    1. Interlock smoke detectors to air handlers for shutdown as specified by prevailing local codes.
D. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.
    1. Each supplier of a controls product shall configure, program, start up, and test that product regardless of where within the contract documents those products are described.
    2. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

3. Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.4 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.
B. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.
C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.
D. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.
E. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.5 FIELD QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances.
B. Continually monitor field installation for code compliance and workmanship quality.
C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.6 WIRING

A. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 26, and manufacturer's recommendations.
B. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 26.
C. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.
D. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.
E. Install wiring in raceway where subject to mechanical damage and at levels below 3 m (10ft) in mechanical, electrical, or service rooms.
F. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.
G. Do not install wiring in raceway containing tubing.
H. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.
I. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.
J. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.
K. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.
L. Include one pull string in each raceway 2.5 cm (1 in.) or larger.
M. Use color-coded conductors throughout.
N. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

O. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.
P. Adhere to requirements in Division 26 where raceway crosses building expansion joints.
Q. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.
R. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.
S. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.
T. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

3.7 COMMUNICATION WIRING

A. Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 3.6 (Wiring).
B. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.
C. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.
D. Verify entire network's integrity following cable installation using appropriate tests for each cable.
E. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.
F. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.
G. Label communication wiring to indicate origination and destination.
H. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."
I. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
    1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
    2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
    3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.

3.8 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.
B. Mount sensors rigidly and adequately for operating environment.
C. Install room temperature sensors on concealed junction boxes properly supported by wall framing.
D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.
E. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m^2 (1 ft^2) of coil area.
G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.
H. Install outdoor air temperature sensors on north wall at designated location with sun shield.
I. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status. 3.10

3.9 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.
B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.
    1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.
    2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.
    3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
    4. Provide necessary mounting hardware and linkages for actuator installation.
C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

3.10 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.
    1. Labels shall use white lettering (12-point type or larger) on a red background.
    2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
    1. Labels shall use white lettering (12-point type or larger) on a red background.
    2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.11 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.
B. Permanently label or code each point of field terminal strips to show instrument or item served.
C. Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.
D. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.
E. Label room sensors related to terminal boxes or valves with nameplates.
F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
G. Label identifiers shall match record documents.

3.12 PROGRAMMING

A. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.
B. Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.
    1. Application Programming. Provide application programming that adheres to sequences of operation. Program documentation or comment statements shall reflect language used in sequences of operation.
    2. System Programming. Provide system programming necessary for system operation.
C. Operator Interface.
    1. Standard Graphics. Provide graphics. Show on each equipment graphic input and output points and relevant calculated points. Point information on graphics shall dynamically update.
    2. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

3.13 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. Complete startup testing to verify operational control system before notifying Owner of system demonstration. Provide Owner with schedule for startup testing. Owner may have representative present during any or all startup testing.
    1. Calibrate and prepare for service each instrument, control, and accessory equipment furnished under this section.
    2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that terminations are tight.
    3. Enable control systems and verify each input device's calibration. Calibrate each device according to manufacturer's recommendations.
    4. Verify that binary output devices such as relays, solenoid valves, two-position actuators and control valves, and magnetic starters, operate properly and that normal positions are correct.
    5. Verify that analog output devices such as I/Ps and actuators are functional, that start and span are correct, and that direction and normal positions are correct. Check control valves and automatic dampers to ensure proper action and closure. Make necessary adjustments to valve stem and damper blade travel.
    6. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.

7. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules. Tune PID loops and each control routine that requires tuning.
8. Alarms and Interlocks.
    a. Check each alarm with an appropriate signal at a value that will trip the alarm.
    b. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.
    c. Test interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.

3.14 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration. Prior to acceptance, perform the following performance tests to demonstrate system operation and compliance with specification after and in addition to tests specified in Article 3.13 (Control System Checkout and Testing). Provide Engineer with log documenting completion of startup tests.
    1. Engineer will be present to observe and review system demonstration. Notify Engineer at least 10 days before system demonstration begins.
    2. Demonstration shall follow process submitted and approved under this section. Complete approved checklists and forms for each system as part of system demonstration.
    3. Demonstrate actual field operation of each sequence of operation. Provide at least two persons equipped with two-way communication. Demonstrate calibration and response of any input and output points requested by Engineer. Provide and operate test equipment required to prove proper system operation.
    4. Demonstrate compliance with sequences of operation through each operational mode.
    5. Demonstrate complete operation of operator interface.
    6. Demonstrate each of the following.
        a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.
        b. Demand limiting. Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.
        c. Building fire alarm system interface.
        d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.
    7. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.
B. Acceptance.
    1. After tests described in this specification are performed to the satisfaction of both Engineer and Owner, Engineer will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot

be performed due to circumstances beyond Contractor's control. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved by owner and engineer.

3.15 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.
B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.
C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.16 TRAINING

A. Provide training for a designated staff of Owner's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.
B. Training shall enable students to accomplish the following objectives.
    1. Proficiently operate system
    2. Understand control system architecture and configuration
    3. Understand DDC system components
    4. Understand system operation, including DDC system control and optimizing routines (algorithms)
    5. Operate workstation and peripherals
    6. Log on and off system
    7. Access graphics, point reports, and logs
    8. Adjust and change system setpoints, time schedules, and holiday schedules
    9. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools
    10. Understand system drawings and Operation and Maintenance manual
    11. Understand job layout and location of control components
    12. Access data from DDC controllers
    13. Operate portable operator's terminals
    14. Create and change system graphics
    15. Create, delete, and modify alarms, including configuring alarm reactions
    16. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
    17. Configure and run reports
    18. Add, remove, and modify system's physical points
    19. Create, modify, and delete application programming
    20. Add operator interface stations
    21. Add a new controller to system
    22. Download firmware and advanced applications programming to a controller
    23. Configure and calibrate I/O points
    24. Maintain software and prepare backups
    25. Interface with job-specific, third-party operator software
    26. Add new users and understand password security procedures
C. Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.
    1. Day-to-day Operators (objectives 1-13)
    2. Advanced Operators (objectives 1-13 and 14-23)
    3. System Managers and Administrators (objectives 1-13 and 24-26)

D. Provide course outline and materials according to Section 23 09 23 Article 1.10 (Submittals). Provide one copy of training material per student.
E. Instructors shall be factory-trained and experienced in presenting this material.
F. Perform classroom training using a network of working controllers representative of installed hardware.

3.17 SEQUENCE OF OPERATION

A. EXHAUST FAN - ON/OFF

1. Run Conditions - Scheduled:
    a. The fan shall run according to a user definable schedule.
2. Fan:
    a. The fan shall have a user definable (adj.) minimum runtime.
3. Fan Status:
    a. The controller shall monitor the fan status.
    b. Alarms shall be provided as follows:
        A. Fan Failure: Commanded on, but the status is off.
        B. Fan in Hand: Commanded off, but the status is on.
        C. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Schedule							×			
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Totals	0	0	1	1	0	0	1	2	3	2

Total Hardware (2) Total Software (6)

B. EXHAUST FAN - THERMOSTAT CONTROL

1. Run Conditions - Continuous:
    a. The unit shall be continuously enabled to maintain a zone temperature cooling setpoint of 80°F (adj.).
2. Alarms shall be provided as follows:
    a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
3. Fan:
    a. The fan shall run anytime the zone temperature rises above cooling setpoint, unless shutdown on safeties.
4. Fan Status:
    a. The controller shall monitor the fan status.
    b. Alarms shall be provided as follows:
        A. Fan Failure: Commanded on, but the status is off.
        B. Fan in Hand: Commanded off, but the status is on.

C. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Cooling Setpoint					×			×		×
High Zone Temp									×	
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Totals	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**4**	**4**	**4**

Total Hardware (3) **Total Software (9)**

C. EXHAUST FAN - ALARM

1. Run Conditions - Continuous:
   a. The fan shall run continuously.
2. Fan:
   a. The fan shall run continuously.
3. Fan Status:
   a. The controller shall monitor the fan status.
   b. Alarms shall be provided as follows:
      A. Fan Failure: Commanded on, but the status is off.
      B. Fan in Hand: Commanded off, but the status is on.
      C. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Alarm									×	×
Totals	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**2**	**4**	**3**

Total Hardware (2) **Total Software (6)**

D. ELECTRIC HEATER

1. Run Conditions - Scheduled:
   The unit shall run according to a user definable time schedule in the following modes:
   a. Occupied Mode: The unit shall maintain a heating setpoint of 70°F (adj.).
   b. Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F (adj.).
      A. Alarms shall be provided as follows:
   c. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
2. Zone Setpoint Adjust:
   a. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
3. Zone Unoccupied Override:
   a. A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.
4. Fan:
   a. The fan shall run as required by heaters safety requirements
5. Electric Heating Stage:
   a. The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.
   b. The heating shall be enabled whenever:
      A. When the zone temperature is below heating setpoint.

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Setpoint Adjust	×									×
Zone Override			×					×		×
Fan Start/Stop				×				×		×
Heating Stage 1				×				×		×
Override								×		
Totals	**1**	**0**	**1**	**2**	**0**	**0**	**0**	**4**	**0**	**4**

Total Hardware (4) **Total Software (4)**

E. GAS PACKAGE
1. Run Conditions - Scheduled:
   The unit shall run according to a user definable time schedule in the following modes:
   a. Occupied Mode: The unit shall maintain
      A. A 74°F (adj.) cooling setpoint
      B. A 70°F (adj.) heating setpoint.
   b. Unoccupied Mode (night setback): The unit shall maintain
      A. A 85°F (adj.) cooling setpoint.
      B. A 55°F (adj.) heating setpoint.
   c. Alarms shall be provided as follows:
      A. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
      B. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
2. Zone Setpoint Adjust:

a. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.

3. Zone Optimal Start:
   a. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
4. Zone Unoccupied Override:
   a. A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.
5. Freeze Protection:
   a. The unit shall shut down and generate an alarm upon receiving a freezestat status.
6. Supply Fan:
   a. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

   b. Alarms shall be provided as follows:
      A. Supply Fan Failure: Commanded on, but the status is off.
      B. Supply Fan in Hand: Commanded off, but the status is on.
      C. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
7. Zone Temperature Control:
   a. The controller shall measure the zone temperature and shall modulate the supply fan VFD speed to maintain zone temperature setpoint. The fan speed shall increase as the zone temperature rises above cooling setpoint,or as the zone temperature drops below heating setpoint. The supply fan VFD speed shall not drop below 30% (adj.).
8. Cooling Stage:
   a. The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.
   b. The cooling shall be enabled whenever:
      A. Outside air temperature is greater than 60°F (adj.).
      B. AND the zone temperature is above cooling setpoint.
      C. AND the supply fan status is on.
      D. AND the heating is not active.
9. Gas Heating Stage:
   a. The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.
   b. The heating shall be enabled whenever:
      A. Outside air temperature is less than 65°F (adj.).
      B. AND the zone temperature is below heating setpoint.
      C. AND the supply fan status is on.
      D. AND the cooling is not active.
10. Return Air Temperature:
    a. The controller shall monitor the return air temperature control.
    b. Alarms shall be provided as follows:
       A. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
       B. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).

	Hardware Points				Software Points					
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Return Air Temp	×							×		×
Zone Override			×					×		×
Freezestat			×					×	×	×
Supply Fan Status			×					×		×
Supply Fan Start/Stop				×				×		×
Cooling Stage 1				×				×		×
Heating Stage 1				×				×		×
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
Supply Fan Failure									×	
Supply Fan in Hand									×	
Supply Fan Runtime Exceeded									×	
Compressor Runtime Exceeded									×	
High Return Air Temp									×	
Low Return Air Temp									×	
Totals	**3**	**1**	**4**	**3**	**0**	**0**	**1**	**12**	**9**	**13**

Total Hardware (11) **Total Software (22)**

F. DX SPLIT SYSTEM COOLING ONLY
   1. Run Conditions - Scheduled:
      a. The unit shall run according to a user definable time schedule in the following modes:
         A. Occupied Mode: The unit shall maintain A 70°F (adj.) cooling setpoint
      b. Alarms shall be provided as follows:
         A. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
   2. Zone Setpoint Adjust:
      a. The occupant shall be able to adjust the zone temperature cooling setpoints at the zone sensor.
   3. Freeze Protection:
      a. The unit shall shut down and generate an alarm upon receiving a freezestat status.
   4. Fan:
      a. The fan shall run anytime the unit is commanded to run, unless shutdown on safeties.
   5. Cooling:

a. The controller shall measure the zone temperature and cycle the compressor to maintain its setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime. The compressor shall run subject to its own internal safeties and controls.
b. The cooling shall be enabled whenever:
A. When space air temperature is greater than 70°F (adj.).
B. AND the fan is on.

6. Fan Status:
a. The controller shall monitor the fan status.
b. Alarms shall be provided as follows:
A. Fan Failure: Commanded on, but the status is off.
B. Fan in Hand: Commanded off, but the status is on.
C. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

7. Alarm Mode:
a. The controller shall monitor the space temperature control.
b. Alarms shall be provided as follows:
A. Supply Fan Failure.
B. High Return Air Temp: If the return air temperature is greater than 75°F (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Freezestat			×					×	×	×
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Compressor Stage 1				×				×		×
Schedule							×			
Cooling Setpoint								×		×
High Zone Temp									×	
Fan Failure									×	
Fan in Hand									×	
Totals	2	0	3	3	0	0	1	9	7	10

Total Hardware (8) Total Software (17)

G. DX SPLIT HEAT PUMP SYSTEM
1. Run Conditions - Scheduled:
a. The unit shall run according to a user definable time schedule in the following modes:
b. Occupied Mode: The unit shall maintain
A. A 74°F (adj.) cooling setpoint
B. A 70°F (adj.) heating setpoint
c. Unoccupied Mode (night setback): The unit shall maintain
A. A 85°F (adj.) cooling setpoint.
B. A 55°F (adj.) heating setpoint.
d. Alarms shall be provided as follows:

A. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
B. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

2. Zone Setpoint Adjust:
    a. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
3. Zone Unoccupied Override:
    a. A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule. Override timer shall be located adjacent to unit thermostat/sensor.
4. Freeze Protection:
    a. The unit shall shut down and generate an alarm upon receiving a freezestat status.
5. Fan:
    a. The fan shall run anytime the unit is commanded to run, unless shutdown on safeties.
6. Heating and Cooling - 1 Compressor Stage:
    a. The controller shall measure the zone temperature and cycle the compressor to maintain its setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime. The compressor shall run subject to its own internal safeties and controls.
    b. The heating shall be enabled whenever:
        A. Outside air temperature is less than 65°F (adj.).
        B. AND the fan is on.
        C. AND the reversing valve is in heat mode.
    c. The cooling shall be enabled whenever:
        A. Outside air temperature is greater than 60°F (adj.).
        B. AND the fan is on.
        C. AND the reversing valve is in cool mode.
    d. On mode change, the compressor shall be disabled and remain off until after the reversing valve has changed position..
7. Fan Status:
    a. The controller shall monitor the fan status.
    b. Alarms shall be provided as follows:
        A. Fan Failure: Commanded on, but the status is off.
        B. Fan in Hand: Commanded off, but the status is on.
        C. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).
8. Alarm Mode:
    a. The controller shall monitor the space temperature control.
    b. Alarms shall be provided as follows:
        A. Supply Fan Failure.
        B. Room fails to maintain temperature setpoints.

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Zone Override			×					×		×
Freezestat			×					×	×	×
Fan Status			×					×		×
Fan Start/Stop				×				×		×
Reversing Valve				×				×		×
Compressor Stage 1				×				×		×
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Totals	2	0	3	3	0	0	1	9	7	10

Total Hardware (8) Total Software (17)

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 2 psig.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Mechanical Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dresser Piping Specialties; Division of Dresser, Inc.
        2) Smith-Blair, Inc.
        3) Approved Equal.

b. Buna-nitrile seals.
c. Steel bolts, washers, and nuts.
d. Coupling shall be capable of joining steel pipe to steel pipe.

2.2 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

2.3 MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. Approved Equal.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.4 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Meter Company.
   b. Invensys.
   c. Maxitrol Company.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton Corporation; Controls Div.
   b. Harper Wyman Co.
   c. Maxitrol Company.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

9. Maximum Inlet Pressure: 0.5 psig.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, or unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

3. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate

3.5 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch..

3.7 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 36 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

3.11 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

A. Aboveground, branch piping NPS 2 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.

B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.

C. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Refrigerant Copper Piping
2. Filter dryers.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.8 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Brazing Filler Metals: AWS A5.8.

2.2 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

2.3 VALVES AND SPECIALTIES

A. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Designed for reverse flow (for heat-pump applications).
4. End Connections: Socket.
5. Maximum Pressure Loss: 2 psig.
6. Rated Flow: Match flow to size of condensing unit.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction and Liquid Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps to entrain oil in vertical runs.

4. Liquid lines may be installed level.
5. Adhere to manufacturers installation recommendations and requirements for all installations.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.

R. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open compressor suction and discharge valves.
2. Open refrigerant valves except bypass valves that are used for other purposes.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible”

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Solvent-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel or aluminum; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire and smoke dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
1. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
2. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
3. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2,

"Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive 1-inch wg.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive or negative 1-inch wg.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive or negative 2-inch wg.

F. Liner:

1. Supply and Return Air Ducts: Outdoor, Type I, 2 inches thick.
2. Supply and Return Air Ducts Indoor: Fibrous glass, Type I, 1 inches thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

b. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Combination fire and smoke dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Flexible ducts.
10. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories.

1. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings and duct hardware.
b. Manual volume damper, backdraft dampers, and barometer dampers.
c. Control-damper.
d. Flexible ducts and duct connectors.
e. Combination fire- and smoke-damper, including sleeves; and duct-mounted access doors and remote damper operators.
f. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

B. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

C. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.
6. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

D. Blades: Multiple single-piece blades, maximum 6-inch width, with sealed edges.

E. Blade Action: Parallel.

F. Blade Seals: Neoprene, mechanically locked.

G. Blade Axles:

1. Material: Galvanized steel or Aluminum.
2. Diameter: 0.20 inch.

H. Tie Bars and Brackets: Aluminum or Galvanized steel.

I. Return Spring: Adjustable tension.

J. Bearings: Steel ball.

K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Insect.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Steel, Manual Volume Dampers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Pottorff.
    d. Ruskin Company.
    e. Vent Products Company, Inc.
2. Comply with AMCA 500-D testing for damper rating.
3. Leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:
    a. Mitered and welded corners.
    b. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized, roll-formed steel, 0.064 inch thick.

7. Blade Axles: Galvanized steel.

8. Bearings:

    a. Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered aluminum.
11. Tie Bars and Brackets: Galvanized steel or Aluminum.
12. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.5 CONTROL DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    1. Greenheck Fan Corporation.
    2. Ruskin Company.
    3. Young Regulator Company.

B. Leakage rating**,** with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

    1. 0.094-inch-thick, galvanized sheet steel.
    2. Mitered and welded corners.

D. Blades:

    1. Multiple blade with maximum blade width of 6 inches.
    2. Parallel-blade design.
    3. Galvanized-steel or Aluminum.
    4. 0.064 inch thick single skin.
    5. Blade Edging: Closed-cell neoprene.
    6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

    1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 COMBINATION FIRE AND SMOKE DAMPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

F. Heat-Responsive Device: Replaceable, 165 deg F rated, fire-closure device.

G. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

H. Smoke Detector: Integral, factory wired for single-point connection.

I. Blades: Roll-formed, horizontal, 0.063-inch-thick, galvanized sheet steel.

J. Leakage: Class I.

K. Rated pressure and velocity to exceed design airflow conditions.

L. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

M. Master control panel for use in dynamic smoke-management systems.

N. Damper Motors: Two-position action.

O. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230900 "Instrumentation and Control for HVAC."
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

P. Accessories:

1. Auxiliary switches for signaling, fan control or position indication.
2. Test and reset switches and damper mounted.

2.7 FLANGE CONNECTORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Approved Equal.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single or Double wall.

2.9 DUCT-MOUNTED ACCESS DOORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Nailor Industries Inc.
3. Pottorff.
4. Approved Equal.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Single wall with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 FLEXIBLE DUCTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. Thermaflex.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install fire and smoke dampers according to UL listing.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
2. Control devices requiring inspection.
3. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 17 inches.

J. Install flexible connectors to connect ducts to equipment.

K. Connect diffusers to ducts directly with maximum 60-inch lengths of flexible duct clamped or strapped in place.

L. Connect flexible ducts to metal ducts with adhesive plus draw bands.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 33 13

COUNTERBALANCED BACKDRAFT DAMPERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum, light to medium duty, backdraft dampers suitable for application in HVAC systems with velocities to 1,500 feet per minute.

1.2 REFERENCES

A. AMCA 500-D – Laboratory Methods of Testing Dampers for Rating.

B. AMCA 511 – Certified Ratings Program for Air Control Devices

1.3 SUBMITTALS

A. Comply with requirements of Section 013300 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data.
   1. Include leakage, pressure drop, and maximum back pressure data.
   2. Indicate materials, construction, dimensions, and installation details.
   3. Include damper pressure drop and leakage ratings based on tests and procedures performed in accordance with AMCA 500-D.

1.4 QUALITY ASSURANCE

A. Pressure Drop Ratings: Damper pressure drop ratings shall be certified in accordance with AMCA 511 and dampers shall be licensed to bear the AMCA Certified Ratings Seal for Air Performance.

B. Leakage Ratings: Damper leakage ratings shall be certified in accordance with AMCA 511 and dampers shall be licensed to bear the AMCA Certified Ratings Seal for Leakage.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer, material, and location of installation.

B. Storage: Store materials in a dry area indoor and protected from damage and in accordance with manufacturer’s instructions.

C. Handling: Handle and lift dampers by sleeve or frame only. Do not lift damper by blades. Protect materials and finishes during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Loren Cook Company.
4. Approved Equal.

2.2 BACKDRAFT DAMPERS

A. Counterbalanced backdraft dampers to be sizes as shown on drawings

B. All relief vents are to have counterbalanced backdraft dampers whether shown on drawings or not. In the event of a conflict of application purposes notify engineer for clarification.

1. Damper blades to be set to open at 0.05” wg.

C. Ratings:
1. Temperature Ratings: -40°F to 200°F.
2. Maximum Velocity: 1,500 fpm.
3. Differential Pressure Ratings: 6.0 in. wg.
4. Leakage: 9.9 cfm/ft^2 @ 1 in. wg. .

D. Construction:
1. Frame: 1-7/8”” x 13/16” x 0.081” extruded aluminum channel with optional front-flange.
2. Blades:
   a. Style: Single-piece, end pivot.
   b. Action: Adjustable counterbalanced backdraft.
   c. Orientation: Vertical mounted, horizontal flow or horizontal mounted, vertical up flow or vertical down flow.
   d. Material: 0.050” extruded aluminum.
   e. Width: Maximum 5.75”.
3. Bearings: Corrosion-resistant, synthetic.
4. Seals: Extruded vinyl.
5. Linkage: On-blade.
6. Finish: Mill aluminum.
   a. Mounting: Select proper mounting type to accommodate orientation of ducting shown on plans documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine area to receive dampers. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization of dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install dampers at locations as indicated on the drawings and in accordance with manufacturer's instructions.

B. Do not compress or stretch damper sleeve or frame into the duct or opening.

C. Handle dampers using the frame or sleeve. Do not lift or move damper using blades.

D. Install dampers square and free from racking with blades running horizontally.

E. Install factory supplied mullion for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Round ceiling diffusers.
2. Louver face diffusers.
3. Slot diffusers.
4. Linear bar diffusers.
5. Rectangular face supply registers.
6. Fixed face return, exhaust and transfer grilles.
7. Egg crate return grilles.
8. Return air filter grilles.
9. Door grilles.

B. Related Sections:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections.

2. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. Titus.
2. Carnes.
3. Price Industries.
4. Krueger.
5. Or approved Equal.

B. Grilles Registers and Diffusers are to be provided as per the schedule provided on the Drawings.

2.2 CEILING DIFFUSERS

A. Round Ceiling Diffusers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Steel, baked enamel, white.
3. Face Size & Style: As noted on drawings.
4. Mounting: Duct connection.
5. Dampers: Radial opposed blade.
6. Accessories:
   a. Operating rod extension.

B. Square Louver Face Diffusers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Steel, baked enamel, white.
3. Face Size & Style: As noted on drawings.
4. Mounting: Lay-in or flanged as noted on drawings and schedules.
5. Pattern: 4-way fixed or as noted on drawings.

C. Slot Diffusers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above: Material: Steel, black.
2. Face Size & Style: as noted on drawings.
3. Mounting: T-bar mounting with insulated plenum
4. Dampers: In supply air branch ducting.
5. Slot Width: Sized as noted on drawings.
6. Number of Slots: Sized as noted on drawings.
7. Length: Sized as noted on drawings.
8. Accessories: Plaster frame.

D. Linear Bar Diffusers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Aluminum, annodized, black.
3. Face Size & Style: As noted on drawings.
4. Mounting: Surface as noted on drawings.
5. Dampers: In supply air branch ducting.

6. Slot Width: Sized as noted on drawings.
7. Number of Slots: Sized as noted on drawings.
8. Length: Sized as noted on drawings.
9. Accessories: Plaster frame.

2.3 REGISTERS AND GRILLES

A. Adjustable Double Deflection Bar Registers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Steel, baked enamel, white.
3. Face Size & Style: as noted on drawings.
4. Face Arrangement: double deflection.
5. Mounting: Flange as noted on drawings.
6. Dampers: opposed blade.

B. Fixed Face Return, Exhaust and Transfer Grilles.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Steel, baked enamel, white.
3. Face Size & Style: As noted on drawings.
4. Face Arrangement: 1/2” spacing with 35° deflection.
5. Mounting: Lay-in or Flanges as noted on drawings.
6. Dampers: provide on exhaust grilles

C. Return Air Filter Grilles.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above:
2. Material: Steel, baked enamel, white.
3. Face Arrangement: 35° deflection, 3/4” blade spacing.
4. Mounting: Lay-in or Flanged as noted on drawings.
5. Filter size: 1”

D. Egg Crate Return Grilles.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the following:
2. Material: Steel, baked enamel, white.
3. Face Size & Style: 2’ x 2’ or as noted on drawings.
4. Face Arrangement: 1/2” x 1/2” Core Spacing.
5. Mounting: Lay-in or Flanges as noted on drawings.

E. Door Grilles.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the manufacturers noted above::
2. Material: Steel, baked enamel, color per architect.
3. Face Size & Style: Sight proof blades to long dimension.
4. Face Arrangement: Inverted V-blades.
5. Mounting: Flanged.
6. Accessories: Provide trim kit.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system air-conditioning and/or heat-pump units (as applicable) consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.
2. Gaskets: One set for each access door.
3. Fan Belts: One set for each air-handling unit fan.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five years from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
3. SANYO North America Corporation; SANYO Fisher Company.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.

c. Enclosure Type: Totally enclosed, fan cooled.
d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
f. Mount unit-mounted disconnect switches on interior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face ASHRAE 62.1.
2) Depth: A minimum of 1 inch deep.

b. Single-wall, galvanized-steel sheet.
c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 3/4.

d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

7. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.2 OUTDOOR UNITS (5 TONS (18 kW) OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
c. Refrigerant Charge: R-410A.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components (If applicable): Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.3 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install and connect refrigerant tubing to component's quick-connect fittings or refrigerant piping connections as applicable. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 23 82 19

FAN COIL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fan-coil units and accessories.

1.3 DEFINITIONS

A. BAS: Building automation system.

1.4 ACTION SUBMITTALS

A. Product Data: Include rated capacities at design conditions, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fan-coil units to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 COORDINATION

A. Coordinate layout and installation of fan-coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

2.2 DUCTED FAN-COIL UNITS

A. Basis-of-Design Product: Carrier Corporation or a comparable product by one of the following:

B. Manufacturers:

1. Carrier Co.
2. Trane.
3. McQuay
4. YORK International Corporation.
5. Approved Equal.

C. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

D. Coil Section Insulation: 1/2-inch thick foil-faced glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

E. Drain Pans: Insulated galvanized steel with plastic liner. Fabricate pans and drain connections to comply with ASHRAE 62.1.

F. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.

G. Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.

H. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.

I. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

J. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

K. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

L. Control devices and operational sequence are specified in Section 230900 “Sequence of Operation.”

M. Electrical Connection: Factory wire motors and controls for a single electrical connection.

N. Capacities and Characteristics: See Equipment Schedules on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before fan-coil-unit installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fan-coil units level and plumb.

B. Install fan-coil units to comply with NFPA 90A.

C. Suspend fan-coil units from structure with elastomeric hangers.

D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.

E. Install new filters in each fan-coil unit within two weeks after Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan-coil-unit with field or factory hydronic piping package.
3. Connect condensate drain to indirect waste.

a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

B. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect a minimum of 5% of installations, field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 238219

SECTION 26 00 50

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 1, General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 26.

B. Each section included in Division 26 is incomplete without the provisions stated herein.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

A. Access doors.

1.3 RELATED SECTIONS

A. Section - Access Doors and Frames.

B. Section - Paints.

C. Section 260126 - Electrical Testing.

1.4 SYSTEM DESCRIPTION

A. Provide a complete operational electrical system. Route conduit and install equipment to avoid conflicts with other trades and to enhance maintainability of system.

1.5 REFERENCES

A. ASTM D 698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600kN-m/cu. m.)).

B. ASTM E 814 - Fire Tests of Through-Penetration Fire Stops.

C. IEEE C2 - National Electrical Safety Code.

D. NFPA 70 - National Electrical Code.

E. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.6 DEFINITIONS

A. Provide: Where the word "provide" is used, the word is understood to mean "the Contractor shall furnish and install" the equipment, tests, inspections, etc. referenced.

B. Related Work: The sections referenced under RELATED SECTIONS shall be understood to include provisions which directly affect the work being specified in the section where RELATED SECTIONS occurs.

C. Concealed: Where the word "concealed" is used in conjunction with raceways, equipment, and the like, the word shall be understood to mean hidden from sight as in chases, furred spaces, or suspended ceilings.

D. Exposed: Where the word "exposed" is used, the word shall be understood to mean open to view.

1.7 SUBMITTALS

A. Access Doors: Indicate detailed dimension.

1.8 REGULATORY REQUIREMENTS

A. Perform work in accordance with NFPA 70 and the editions, revisions, amendments, or supplements of applicable statutes, ordinances, codes, or regulations of Federal, State, and Local Authorities having jurisdiction in effect on the date bids are received.

B. Where approval standards have been established by OSHA, UL, ASME, AGA, AMCA, ANSI, ARI, NFPA, State Fire Insurance Regulatory Body, and FM. Follow these standards whether or not indicated on the Drawings and Specifications. Include cost of work required to comply with requirements of these authorities in the original proposal. Comply with IEEE C2 where applicable.

C. Requirements in reference specifications and standards are minimum for equipment, material, and work. In instances where capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified or scheduled capacities.

D. Resolve code interpretations discovered in Contract Documents with A/E prior to Contract award. After Contract award, make corrections or additions necessary for compliance with applicable codes.

E. Arrange with local and state authorities and utility companies for permits, fees, and service connections, verifying locations and arrangement, and pay charges including inspections.

1.9 CONTRACT DRAWINGS

A. Drawings are generally diagrammatic and are intended to encompass a system that will not interfere with the structural and architectural design of the building. Coordinate work to avoid interferences between conduit, equipment, architectural, and structural work.

B. Coordinate with architectural features, trim and millwork details, and install equipment in cabinets or other special areas as directed by A/E.

C. Drawings are based on equipment specified. Make adjustments, modifications, or changes required, due to use of other equipment.

1.10 PROJECT/SITE CONDITIONS

A. Site Visitation: Visit the site of the proposed construction to become thoroughly familiar with details of work and working conditions, verify dimensions in the field, and advise A/E of discrepancies before performing work.

B. Space Requirements:
1. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.
2. Make changes in equipment location of up to 5 feet, to allow for field conditions prior to actual installation, and as directed by A/E.
3. Conceal conduit in finished areas. Conduit may be exposed in mechanical rooms, electrical rooms and where specifically allowed on Drawings. Route conduit through the building without interfering with other contractors' equipment or construction.
4. Provide maximum possible clear height underneath conduit. Install conduit as high as possible.
5. Install equipment requiring service so that it is easily accessible.
6. Compare the equipment sizes with the space allotted for installation before installation and make written notice of possible conflict. Disassemble large equipment to permit installation through normal room openings when required. Should written notice not be made in a timely manner, make adjustments and modifications necessary without additional compensation.
7. Timely place equipment too large to fit through finished openings, and stairways.

C. Site Obstructions:
1. Drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed as to accuracy of location or completeness of information.
2. Verify with A/E, utility companies, municipalities, and other interested parties that available information has been provided before cutting or trenching operations are begun. Verify locations given.
3. Alter routing of new work should obstruction be encountered, whether or not shown on Drawings. Reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
4. Assume total responsibility for and repair damage to existing utilities or construction, whether or not such existing facilities are shown. Repair the lines, if damaged.

D. Cutting and Patching:
1. Execute cutting and demolition by methods which will prevent damages to other work and will provide proper surfaces to receive installation of repairs.
2. Restore work which has been cut or removed; install new products complying with specified products, functions, tolerances and finishes as specified.
3. Escutcheon Plates:
   a. Heavy chrome-plated or nickel-plated escutcheon plates for penetrations of finished surface.
   b. Product: B&C No. 10 with concealed hinges.
4. Fit work airtight to conduit, sleeves, and other penetrations through surfaces. Comply with Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated assemblies.

1.11 MATERIALS AND WORKMANSHIP

A. Provide new materials and equipment of a domestic manufacturer by those regularly engaged in the production and manufacture of specified materials and equipment. Where UL or other agency has established standards for materials, provide materials which are listed and labeled accordingly. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Work shall be performed by workmen skilled in the trade required for the work. Install materials and equipment to present a neat appearance when completed and in accordance with the approved recommendations of the manufacturer and in accordance with Contract Documents.

C. Provide labor, materials, apparatus, and appliances essential to the complete functioning of the systems described or indicated herein, or which may be reasonably implied as essential whether mentioned in the Contract Documents or not.

D. Make written request to A/E for supplementary instructions in cases of doubt as to Work intended or in event of need for explanation thereof.

E. Performance and material requirements scheduled or specified are minimum standards acceptable. The right to judge the quality of equipment that deviates from the Contract Documents remains solely with A/E.

1.12 DELIVERY, STORAGE AND HANDLING

A. Follow the manufacturer's directions completely in the delivery, storage, and handling of equipment and materials.

B. Store equipment in a clean, dry place, protected from other construction. While stored, maintain factory wrappings or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

C. Adequately brace and package equipment to prevent breakage and distortion while in transit.

1.13 EXCAVATION

A. Trenching:
   1. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching, and shoring. Keep surface drainage of adjoining areas unobstructed. Waste excavated materials not required or satisfactory for backfill. Remove water by pumping or other approved methods, discharge at a safe distance from the excavation.
   2. Provide trenches of necessary width for proper laying of conduit and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade to bottoms of trenches to provide uniform bearing and support for each section of conduit on undisturbed soil or the required thickness of bedding material at every point along its entire length.

3. Provide minimum 12 inches between outer surfaces and embankment or shoring which may be used, when excavating for manholes, pull boxes, and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.
4. Material to be excavated is "unclassified." No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.
5. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines constructed during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, Owner, and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.
6. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finish grades, whichever is lower:
   a. 3-Foot Minimum Cover: Raceways for primary voltage conductors.
   b. 2-Foot Minimum Cover: Raceways for secondary conductors.

B. Backfilling:
1. Backfill trenches after conduit, fittings, and joints have been tested and approved.
2. Backfill trenches with sand to provide 6 inches sand below conduit and 12 inches sand cover. Backfill remainder of trenches with satisfactory materials consisting of earth, loam, sandy clay, sand, and gravel, or soft shale, free from large clods of earth and stones not over 1-1/2 inch in size, and deposit in 9-inch maximum layers, loose depth as indicated or specified. Take care not to damage utility lines. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers, and compact by mechanical means. Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, then refill and compact with the surface restored to the required grade and compaction.
3. Where trenches cross streets, driveways, building slabs, or other pavements, backfill trench utility line with sand backfill material in 6 inch layers. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

1.14 PAINTING

A. Comply with painting Section.

B. Properly prepare surfaces to receive paint. Prime prepared surfaces and finish with two coats of exterior oil base paint. Verify primer and paint are rated for application.

C. Repair damage to factory painted finishes.

D. Remove splattered and incidental paint from electrical equipment.

1.15 PILOT INSTALLATION

A. Provide a pilot installation of items of equipment which are concealed and require service, such as disconnect switches above ceiling, bus duct above ceiling, and transformers above ceiling. Have pilot installation approved by A/E before further installation work is performed for the particular items of equipment.

1.16 ACCESS DOORS

A. Coordinate requirements with Architect.

1.17 NOISE AND VIBRATION

A. Provide the entire operating system and its component items of equipment free of objectionable vibration or noises. Statically and dynamically balance rotating equipment, and mount or fasten so that no equipment vibration will be transmitted to the building. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, ballasts, or other parts of the work, rectify such condition at no additional compensation.

1.18 OPERATING INSTRUCTIONS

A. Provide services of authorized representatives of manufacturer to ensure that the equipment is installed according to the manufacturer's recommendations, is operating properly, and to instruct Owner's operating personnel during start-up and operating tests of complete electrical system. Notify A/E seven days prior to beginning equipment start-up.

B. Certify in writing that these services have been performed.

C. Perform tests as specified in Section 260126.

1.19 SERVICE

A. Inspect, clean, and service light fixtures; replace incandescent lamps; and replace fluorescent or HID lamps if utilized for construction lighting immediately prior to final acceptance of project.

B. Clean and polish fixtures, equipment, and materials thoroughly, and return to "as new" condition.

C. Remove excess material and debris. Place electrical systems in complete working order before request for final review. Broom clean areas.

1.20 PROJECT RECORD DOCUMENTS

A. Provide as specified in Division 01.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 26 00 51

ELECTRICAL SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation and submission of shop drawings and product data.

1.2 RELATED SECTIONS

A. Section 26 01 20 - Operation and Maintenance Manuals.

1.3 MANUFACTURERS

A. Listed manufacturers will be acceptable as long as specified requirements are met.

B. Manufacturers who are not listed as "acceptable manufacturers" bear the burden of proof to A/E that their products comply with the specifications. Furthermore, those manufacturers shall agree in writing to bear the cost of A/E time to review compliance with the specifications whether their products are approved or not.

C. Provide power distribution and control equipment of the same manufacturer (i.e., switchboards, panelboards, transformers, motor control centers).

D. Provide similar equipment of same manufacturer (i.e., wiring devices).

1.4 CONTRACTOR'S CERTIFICATION

A. Submittals will be submitted only by the Contractor. Indicate by signed stamp that the contract documents have been checked, that the work shown in the submittals is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If submittals are submitted for review that have not been checked and signed by the Contractor, they will be returned for checking before being considered by A/E.

1.5 PREPARATION

A. Include information relevant to particular equipment or materials to be furnished, where product data published by manufacturer is part of submittal.

B. Provide documentation of compliance with manufacturer's published literature or drawings or letter signed by officer of manufacturer in cases where compliance with UL, FM, ARI, IRI, or other similar organization standards are required.

C. Furnish submittals within 45 days after receiving a signed contract and prior to the start of installation.

D. Include identifying symbols and equipment numbers used in the contract documents for all equipment and material submitted.

E. Cross reference sheet numbers on Drawings for shop drawings. Provide shop drawings consisting of plans drawn to scale, with elevations and sections, to show clearly the location of major items of equipment and clearances for maintenance and code requirements.

F. Submit only the requested submittals complete by types of equipment (i.e., lighting fixtures, power distribution, etc.) labeled with applicable specification section(s) included. Each submittal will be handled separately. Should any item not be acceptable, the entire submittal will be returned to the Contractor for correction and resubmittal. Partial submittals are unacceptable. The intent of this requirement is that all approved bound sets of data will be identical and will contain only acceptable information.

G. Submit a compliance sheet for each submittal indicating the submittal is in full compliance with the drawings and specifications. Indicate by drawing number or specification section number and paragraph numbers all exceptions taken and include an explanation.

H. The review of submittals does not relieve or modify the Contractor's responsibility for compliance with the Contract Documents or dimensions or errors contained in the submittal or quantity count. It is clearly understood that, in the review process, noting of some discrepancies but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the submittals, the Contract Documents govern the work, and are neither waived nor suspended in any way by the review of the submittals.

I. A minimum review period of two weeks, exclusive of transmittal time, will be required in A/E office for each submittal. Take this time period into consideration when scheduling construction.

J. Include in submittals sufficient plans, elevations, sections, performance data, dimensions, bolt locations, ratings, sound data, weights and schematics to clearly describe the equipment and to show compliance with these specifications. Provide a cover or title sheet for the submittal containing the following:
   1. Name of Contractor originating the submittal.
   2. Name of project for which the submittal is made.
   3. An index of all items submitted including:
      a. Mark of equipment on drawings.
      b. Manufacturer.
      c. Catalog number.
      d. Specification section number.
   4. Date of submittal and date of each revision.
   5. Contractor's certification of review.
   6. Contractor's certification of compliance.

K. Shop drawings and product data which do not comply with the requirements herein will be returned for resubmittal. Submit electronic copies for shop drawings.

L. A/E will retain one copy and Owner will retain one copy of submittal. Remaining copies will be returned to Contractor marked FURNISH AS SUBMITTED, FURNISH AS CORRECTED, REVISE AND RESUBMIT or SUBMIT SPECIFIED ITEM. If it is marked FURNISH AS SUBMITTED or FURNISH AS CORRECTED, no additional submittal is required. If it is marked REVISE AND RESUBMIT or SUBMIT SPECIFIED ITEM, repeat submittal in accordance with this section. Submit complete and accurate shop drawings

and product data at first submittal. If submittals are returned to Contractor marked REVISE AND RESUBMIT or SUBMIT SPECIFIED ITEM, only one additional submission will be permitted.

M. If the product data marked FURNISH AS SUBMITTED or FURNISH AS CORRECTED is altered for any reason after it has been stamped, the REVIEWED stamp shall automatically be voided.

N. Provide all work in accordance with the submittals stamped FURNISH AS SUBMITTED or FURNISH AS CORRECTED inasmuch as they are in agreement with the Contract Documents. Where differences occur between the submittals and the Contract Documents, the Contract Documents shall govern the work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

A. Furnish product data for devices, equipment, or systems as specified. Other submittals will be returned to Contractor without review. Furnish shop drawings as indicated.

3.2 FINAL SUBMITTAL

A. In addition to the number of copies of shop drawings and product data required to review submittals, maintain separate file of final reviewed copies of such material. Deliver approved submittals in a hard-back binder for the Owner's use. Incorporate changes and revisions made throughout the construction period. Refer to Section 260120.

END OF SECTION

SECTION 26 01 26

ELECTRICAL TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Test electrical systems and equipment.

B. These tests are required to determine that the equipment involved may be safely energized and operated.

C. Perform tests by and under the supervision of fully experienced and qualified personnel. Advise each respective manufacturer's representative of tests on their equipment.

D. Record all test data.

E. Each section of Division 26 that has products or systems listed herein incorporate this section by reference and is incomplete without the required tests stated herein.

1.2 REFERENCES

A. ANSI/IEEE C37.20 - Circuit Breakers, Switchgear, Substations, and Fuses.

B. NEMA WC 8 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

C. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit test report forms for review a minimum of 90 days prior to requesting a final review by A/E.

B. Furnish electronic copies of test data. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken, both prior to and after any corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation.

C. A/E will retain one copy. Remaining copies will be returned to Contractor for inclusion in the operation and maintenance manuals.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Furnish proposed test procedures, recording forms, list of personnel and test equipment for A/E review.

B. Follow recommended procedures for testing as published by test equipment manufacturer.

3.2 WIRE AND CABLE

A. Test insulation resistance of each main feeder and service after the installation is complete but before the connection is made to its source and point of termination.

B. Test insulation resistance using Biddle Megger or equivalent test instrument at a voltage not less than 1,000 volts DC. Measure resistance from phase-to-phase and phase-to-ground. In circuits where insulation test value is lower than 1 megohm, remove and replace conductor and retest.

C. Visually inspect connections of every branch circuit for tightness.

D. Ensure that grounding conductor is electrically continuous.

E. Test branch circuits against grounds, shorts or other faults.

F. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

G. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.

H. Test system for stray currents and ground shorts. If stray currents and shorts are detected, eliminate or correct as required.

3.3 WIRING DEVICES

A. Operate switches at least twice.

B. Test every convenience outlet with plug-in device for proper phasing and grounding.

C. Demonstrate operation of lighting circuits and lighting control systems.

3.4 ELECTRICAL SWITCHGEAR

A. Before Energization:
   1. Visually inspect connections for tightness and correctness.
   2. Verify proper fusing.

B. After Energization:
   1. Verify proper voltage with system operating at load conditions.

2. Verify proper operation.
3. Operate every circuit breaker, switch and contactor.
4. Modify tap settings on transformers as required.
5. Measure line amperes with system operating at load conditions.
6. Modify circuit breaker and relay settings as required.
7. Megger meter centers for opens, shorts and grounds.
8. Thermographic Tests:
   a. With system operating at load conditions, perform thermographic test on switchgear, bus duct, control centers, distribution panels, lighting panels and equipment feeders using an infrared temperature scanning unit.
   b. Tighten or correct connections with higher temperatures than acceptable. After corrections have been made, perform thermograph test to confirm that problems have been corrected.

C. Operate all equipment and control systems through intended sequence. Record all data pertaining to system operation.

3.5 GROUND FAULT

A. Factory test switchboards at the manufacturer's factory prior to shipment as specified herein.
   1. Furnish a ground fault protection system test for circuit testing and verification of the tripping of the ground fault relays at the factory location. Pass predetermined values of current through the relay sensors and measure the relay tripping time for each phase and neutral sensor. Compare the measured time-current relationships to the trip-characteristic curves for each relay.
   2. Furnish test results certified by the switchboard manufacturer. One reviewed copy to be available at the job site for review by the authority having jurisdiction.
   3. Upon completion of the factory ground fault protection system tests, the current and time adjustment on each relay are to be set on their minimum values.

B. After construction work is complete and prior to energizing switchboards, field ground fault protection system; provide reset to manufacturer's recommended settings.

3.6 SECONDARY GROUNDING

A. Test service entrance ground resistance.

B. Provide additional made-electrodes if resistance is more than 3 ohms.

C. Test grounding system resistance within building at a minimum of ten locations.

D. Measure and record the voltage and current in each feeder, and plug in bus duct after all connections have been made and the bus duct is under load.

E. Perform thermograph test with bus duct operating under actual load conditions. Tighten or correct connections with higher temperatures than acceptable. After corrections have been made, perform thermograph test to confirm that problems have been corrected.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 26 05 26 – Grounding and Bonding Systems.
2. Section 26 01 26 – Electrical Testing.
3. Section 26 05 33 – Raceways and Boxes for Electrical Systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. Triangle PWC, Inc.
3. Belden Inc.
4. Carol.
5. General Cable Technologies Corporation.
6. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Aluminum conductors are acceptable where indicated.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco.
6. NSi Industries LLC.
7. O-Z/Gedney.
8. 3M.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: 600 volt insulation; copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: 600 volt insulation; copper. Solid for No. 12 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Feeders: Below grade - Type XHHW, single conductors in raceway; above grade - Type THW/THWN, single conductors in raceway.

C. Branch circuits: Type THHN/THWN, single conductors in raceway.

D. Feeders and branch circuits in Cable Tray: Type THHN-2-THWN-2, single conductors in raceway, or Type TC, Type MC tray-rated multi-conductor cables.

E. NFPA 70 restricts use of exposed Type NM cable in some types of construction. See NFPA 70, Article 334, for complete listing of restrictions.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

G. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THWN.

H. Plenum Cable: Provide plenum rated cable where cable is installed exposed in plenums.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Use No. 10 AWG conductor minimum for 20 ampere, 120 volt branch circuits longer than 100 feet, and for 20 ampere, 277 volt branch circuits longer than 200 feet.

H. Provide homerun conductors of continuous length without joint or splice from overcurrent device to first outlet.

I. Provide main service and feeder conductors of continuous length without joint or splice for their entire length.

J. Install wiring in conduit, unless indicated otherwise.

K. Neatly train and lace wiring inside boxes, panelboards, switchgear, motor control centers, wiring gutters, and other equipment using Thomas & Betts "Ty-Wraps."

L. Provide equal conductor lengths for all parallel circuits.

M. Provide individual neutral for branch circuits.

N. Drawings indicate proposed circuiting only, and do not indicate every conductor unless intent is unclear and further clarification is required. Provide the necessary travelers for all three-way and four-way switches.

O. Tag each circuit in an outlet box where two or more circuits run to a single outlet as a guide for the fixture hanger in making connections.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.6 COLOR CODING

A. Color code distribution systems as follows:
1. 120/208V System:

Phase	Color
A	Black
B	Red
C	Blue
N	White
G	Green

2. 277/480V System:

Phase	Color
A	Brown
B	Orange
C	Yellow
N	Gray/White
G	Green

3. For areas where local authority color coding differs from that specified, contact A/E for instructions.

Provide color coding throughout the full length of all wire No. 6 and smaller. Identification by permanent paint bands or tags at the outlets will be acceptable for wire sizes larger than No. 6. Provide the same color and shade of color throughout the project.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials, including:
   1. Power system grounding.
   2. Communication system grounding.
   3. Electrical equipment and raceway grounding and bonding.
   4. Structural steel grounding.
   5. Miscellaneous system grounding.

1.2 RELATED SECTIONS

A. Section 26 01 26 - Electrical Testing.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 33 – Raceways and Boxes for Electrical Systems.

1.3 REFERENCES

A. NECA - Standard of Installation.

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Provide grounding system incorporating following elements as grounding electrodes:

   1. Metal underground water pipe.
   2. Metal frame of the building.
   3. Concrete-encased electrode.

4. Rod electrode.

B. Grounding System Resistance: 5 ohms.

1.5 SUBMITTALS

A. Product Data: Submit grounding electrodes and connections; for fastening components; and nameplates, labels, and markers.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

C. Manufacturer's Installation Instructions: Submit for active electrodes.

D. Project Record Documents: Record actual locations of components and grounding electrodes.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in products specified in this Section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rod Electrodes: Copper-encased steel, 3/4-inch diameter, minimum length 10 feet.

B. Mechanical Connectors:
1. Manufacturers:
a. Burndy.
b. O.Z. Gedney.
c. Or equal.
2. Heavy-duty, bolt-type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.

C. Exothermic Connections:
1. Type for underground and structural steel; Cadweld, or equal.
2. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

D. Wire:
   1. Stranded, copper cable.
   2. Foundation Electrodes: Size to meet NFPA 70 requirements.
   3. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.1 GROUNDING AND BONDING INSTALLATION

A. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Install 4 AWG bare copper wire in foundation footing where indicated.

C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

D. Bond together metal siding not attached to grounded structure; bond to ground.

E. Bond together reinforcing steel and metal accessories in pool and fountain structures.

F. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use 2 AWG bare copper conductor.

G. Provide isolated grounding conductor for circuits supplying electronic equipment and personal computers.

H. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

I. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

J. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

K. Do not use spring steel clips and clamps.

L. Do not use powder-actuated anchors.

M. Do not drill or cut structural members.

3.2 ELECTRIC SERVICE GROUND

A. Ground electrical service system neutral at service entrance equipment to grounding electrodes.

B. Bond together system neutrals, service equipment enclosures, and equipment grounding conductor at service entrance.

C. Connect electric service grounding electrode conductors to incoming metal water pipe system (when available, using suitable ground clamp) and to ground rod, ground loop, or other supplemental electrode.

D. Provide grounding and bonding at power company metering equipment.

E. Provide test wells for access to ground grid and removable connections for testing system.

3.3 GROUND LOOP

A. Provide electrically continuous ground system consisting of minimum of No. 4/0 copper main ground loop and ground rod stations with bare copper conductors connected to ground rod stations. Verify that resistance to ground between any point on system does not exceed 5 ohms.

B. Install ground conductors in contact with earth below frost line or minimum of 30 inches whichever is deeper.

3.4 EQUIPMENT GROUND

A. Provide complete ground system for building consisting of copper cable, ground rods, and exothermic connections to serve service entrance, building structural steel, metallic enclosures, and conduit systems.

B. Provide separate, insulated equipment grounding conductor from main service ground to each main switchboard and in feeders and branch circuits. Terminate each end a grounding lug, bus, or bushing. Do not use conduit as grounding conductor.

C. Provide bonding jumper at expansion joints, points of electrical discontinuity, or connections in conduit where firm mechanical bond is not possible, such as flexible connections and insulating couplings.

D. Ground each lighting and power panelboard by connecting grounding conductor to grounding stud.

E. Ground casing of each secondary dry-type transformer to ground bus of primary side panelboard. Ground transformer neutral stud to nearest structural steel member. Provide bonding jumper between ground stud and neutral.

F. Bond every item of equipment served by electrical system to building equipment ground system including switchboards, panelboards, disconnect switches, receptacles, controls, fans, air handling units, pumps, fire sprinkler piping, gas piping, and flexible duct connections.

3.5 ISOLATED GROUNDING SYSTEMS

A. Use insulated equipment grounding conductor and connect only to separate grounding electrode as shown.

3.6 COMMUNICATIONS GROUND

A. Provide communications system grounding conductor at point of service entrance and connect to ground loop.

B. Use minimum No. 6 AWG copper conductor for communications service grounding conductor. Leave 10-foot slack conductor at terminal board.

3.7 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Supporting devices, including:
   1. Conduit and equipment supports.
   2. Fastening hardware.

1.2 COORDINATION

A. Coordinate size, shape and location of concrete pads with section on cast-in-place concrete.

B. Coordinate size, shape and requirements for utility company equipment with local utility company.

1.3 QUALITY ASSURANCE

A. Provide support systems adequate for weight of equipment and conduit, including wiring which they carry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Unistrut.

B. B-Line

C. Or equal.

2.2 MATERIAL

A. Support Channel: Galvanized or painted steel.

B. Hardware: Galvanized or painted steel.

C. Provide epoxy or PVC coated materials for corrosive environments.

D. Spring steel clips.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps or bolts.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; sheet metal screws in sheet metal studs and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors on new concrete structure.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. Provide concrete pads and equipment bases for all outdoor equipment on grade, floor mounted equipment, areas with floors below grade, and where shown on Drawings.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Do not support conduit from ceiling wire supports.

K. Do not use spring steel clips and clamps or support conduits by individual hanger wires.

L. Where multiple runs of conduit can be run grouped together, run conduit in racks supported from the building structure. Provide for future use of rack by properly planning routing of conduits in and through restricted areas such as through walls and around mechanical and electrical equipment.

M. Use spring steel clips with EMT for individual branch circuits and device boxes in drywall construction.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

C. EMT: Electrical Metallic Tubing.

D. FMC: Flexible Metallic Conduit.

E. LFMC: Liquid-tight Flexible Metallic Conduit.

F. PVC: Poly-Vinyl Chloride Conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Republic Conduit.
7. Robroy Industries.
8. Southwire Company.
9. Thomas & Betts Corporation.
10. Western Tube and Conduit Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type**:** Setscrew or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651B.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 1684A and NEMA TC 14.

J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Moulded Products, Inc.
2. Hoffman; a Pentair company.
3. Lamson & Sessions; Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect, ready for field painting.

1. Manufacturers: Subject to compliance with requirements provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell Incorporated; Wiring Device-Kellems Division.
b. Mono-Systems, Inc.
c. Panduit Corp.

d. Wiremold / Legrand.

D. Tele-Power Poles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2. Material: Aluminum with clear anodized finish.
3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. FSR Inc.
5. Hoffman; a Pentair company.
6. Hubbell Incorporated; Killark Division.
7. Kraloy.
8. Milbank Manufacturing Co.
9. Mono-Systems, Inc.
10. O-Z/Gedney; a brand of EGS Electrical Group.
11. RACO; a Hubbell Company.
12. Robroy Industries.
13. Spring City Electrical Manufacturing Company.
14. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
15. Thomas & Betts Corporation.
16. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: [Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions**:** 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep). Coordinate "Hinged-Cover Enclosures" Paragraph below with Drawings if hinged-cover enclosures other than NEMA 250, Type 1 are required, such as for very dusty areas; or if consideration should be given to use of NEMA 250, Type 3R or Type 12 enclosures.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:

1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. CDR Systems Corporation; Hubbell Power Systems.
   d. NewBasis.
   e. Oldcastle Precast, Inc.; Christy Concrete Products.
   f. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC."
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
   a. Carson Industries LLC.
   b. CDR Systems Corporation; Hubbell Power Systems.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC; IMC.
2. Concealed Conduit, Aboveground: GRC; IMC; EMT.
3. Underground Conduit: RNC; Type EPC-40-PVC; Type EPC-80-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): [LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC; IMC. Raceway locations include the following:

   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC; IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in commercial kitchens and damp or wet locations.

C. Minimum Raceway Size 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm)of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m)intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions. Provide a minimum of 2 inches space separation between raceways.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm)radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT]conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight**:** 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C**)** temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F

(0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires**,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches (150 mm) in nominal diameter.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.
3. Manholes.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes, and other utility structures.
4. Warning tape.
5. Warning planks.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Ladder Step details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

C. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency.

D. Source quality-control test reports.

E. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect or Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's or Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.3 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC." or "TELEPHONE." As indicated for each service.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. CDR Systems Corporation.
    d. NewBasis.

C. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, comparable product by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. Christy Concrete Products.
    d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

2.4 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC**,** NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths, Walks,Driveways andRoadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.

3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

3.3 EARTHWORK

A. Excavation and Backfill: Do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 017329 "Cutting and Patching."

3.4 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm), both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

F. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

G. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to

prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.

3. Excavate trench bottom to provide firm and uniform support for duct bank.
4. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
5. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
6. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade, unless otherwise indicated.
7. Set elevation of bottom of duct bank below the frost line.
8. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
9. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

10. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried ducts and duct banks, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.

3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes as indicated.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.

3.6 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   a. Comply with the requirements as defined in the IBC.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Pads : Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant

2. Copy paragraph and subparagraphs below for each type of spring isolator configuration required for Project. Use drawing designation and coordinate with the Electrical Vibration-Control and Seismic-Restraint Device Schedule on Drawings.

C. Spring Isolators : Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators : Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building

structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and]seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Items for identification of electrical products installed under Division 26.

1.2 SUBMITTALS

A. Submit product data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. W.H. Brady Co.

B. Carlton Industries, Inc.

C. Seton Nameplate Co.

D. Or equal.

2.2 MATERIALS

A. Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.

B. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

C. Underground Warning Tape:
1. Manufactured polyethylene material and unaffected by acids and alkalies.
2. 3.5 mils thick and 6 inches wide.
3. Tensile strength of 1,750 pounds per square inch lengthwise.
4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background conforming to APWA recommendations.

D. Panelboard Directories: Provide typed circuit directory for each panelboard. Mount circuit directory in a permanent, clear Lexan card holder located on inside of door on panelboard.

E. Conduit Markers: Flexible vinyl film with pressure sensitive adhesive backing and printed markings.
1. Include following identifying tiles on orange background except as noted.

a. Typical:
   1) Type: Example - AC 60 hertz.
   2) Load: Example - Lighting and power.
   3) Voltage: Example - 480 VAC/3 phase.

b. As Noted:
   1) If more than one type of power is available in a conduit, mark with title "Electrical" on orange background.
   2) Limit switch controls, air conditioning controls and diffuser controls with title "Control" on orange background.

2. Conduit that Contains Protective Communication Systems: Provide exact content and title on blue background; install and locate as specified for conduit.

F. Conduit Markers and Letter Size:

Outside Diameter of Conduit (inches)	Width of Color Band	Size of Letter and Numerals
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 & Larger	12	1-1/4

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Embossed tape will not be acceptable.

E. Provide underground tape at electrical installations.

3.2 WIRE AND CABLE LABELING

A. Provide wire markers on each conductor in splice boxes, pull boxes, and at first load connection on homerun. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

B. Identify branch circuit or feeder number for power and lighting circuits on cover of pull and junction boxes with indelible marker.

3.3 EQUIPMENT LABELING

A. Provide nameplates to identify all electrical distribution and control equipment.

B. Engraved, Laminated Plastic Nameplates: 1/4-inch letters, equipment designation; 1/8-inch letters, source circuit number. Provide for:
   1. Meters.
   2. Panelboards.
   3. Switchboards including each individual device or piece of equipment within a switchboard.
   4. Motor control center including each individual device with a motor control center.
   5. Enclosed switches, starters, circuit breakers and contactors. Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, design letter, service factor, and voltage/phase rating. Provide phenolic nameplate on cover exterior to indicate motor served.
   6. Transformers if identified on Drawings.

C. Identify junction boxes by circuit number with legible permanent ink marker.

3.4 BOX AND COVER COLOR CODING

A. Fire Alarm Wiring: Red.

B. Emergency System Wiring: Yellow enamel.

3.5 CONDUIT MARKERS

A. Location of Identifying Markers: At each end of conduit run and at intermediate points 50 feet maximum on center.

END OF SECTION

SECTION 26 05 73

SHORT CIRCUIT ANALYSIS AND COORDINATION STUDY

PART 1 - GENERAL

1.1 SCOPE

A. The contractor shall provide an engineering analysis and coordination study for the entire electrical system**.** The basic analysis shall include a short-circuit analysis with protective device evaluation, a protective device coordination study. In addition the study shall include a motor starting study, load flow/voltage drop study, a harmonics analysis and an Arc Flash study.

B. The project shall begin at the point of utility service for the facility and continue down through the system, to all downstream distribution and branch panelboards, motor control centers and significant motor locations.

C. The project shall include any new generators and any associated emergency power distribution equipment, including automatic transfer switches and generator ground fault protection.

1.2 RELATED DOCUMENTS

A. Single line diagrams

B. Specifications

1.3 SUBMITTALS

A. General. Submit the following according to Conditions of the Contract and Division 1 Specification Sections:

B. Submit for review six copies of the protection coordination study.

C. Shop drawings for equipment effected by the coordination study will not be reviewed until the coordination study has been submitted and approved.

D. Qualification data for firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Engineer and Owner, and other information specified.

E. A one-line diagram of the system shall be included.

F. The final report shall be bound in a three-ring binder.

G. The final report shall contain individual, tabbed sections for each section. Each tabbed section shall contain the information as outlined in Part 2 of this document. Tab 1 shall list the manufacturer’s name, address, general business phone number, after hours service phone number, spare parts phone number, distributor’s name, address, general business phone number, after hours service phone number and spare parts phone number. Tab 2 shall contain Section 2.2’s short-circuit analysis with protective device evaluation. Tab 3 shall contain Section 2.3’s protective device coordination study. Tab 4 contains Section 2.4’s information and so on.

1.4 RELATED STANDARDS

A. All studies shall be performed in accordance with the latest applicable IEEE and ANSI standards.

1.5 QUALITY ASSURANCE

A. Preparer Qualifications: Firm experienced in the analysis, evaluation, and coordination of electrical distribution systems and similar to the system for this project. Firm must have at a minimum a 4 year record of successful in-service performance.

B. The study shall be prepared in accordance with the latest edition of NETA Std. ATS, NFPA 70B, the “National Electrical Code”, ANSI C2” National Electrical Safety Code”, and ANSI/IEEE Guidelines, as well as manufacturer’s recommendations.

C. Short-Circuit Analysis and Coordination Study shall be performed by a registered Professional Engineer. Study shall be signed and sealed by the Engineer. The Engineer shall have a minimum of eight years experience in the analysis, evaluation, and coordination of electrical distribution systems.

D. The firm conducting the study shall have one million worth of Professional Liability Insurance in addition to standard general insurance.

1.6 DELIVERY, STORAGE AND HANDLING

A. The six sets of submittals shall be submitted for review and approval to:
   1. Engineer of Record.

B. The six sets are due and are required prior to the review of the shop drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Engineering analysis and coordination study shall be performed by Siemens or an approved, acceptable and qualified equal by:
   1. Siemens

2.2 SHORT-CIRCUIT ANALYSIS WITH PROTECTIVE DEVICE EVALUATION

A. Systematically calculate fault currents based on the available fault current at the facility service entrance. Study preparer shall obtain the available fault current from the local utility.

B. Short-circuit calculations shall be prepared by means of a digital computer utilizing a commercially available software package. Motor contribution shall be incorporated in determining fault levels. Results of short-circuit calculations shall be presented in tabular form and shall include momentary and interrupting fault values for three-phase and phase-to-ground faults.

C. Analyze the short-circuit currents by preparing a tabulation comparing the fault levels to the device interrupting ratings. Indicate areas in which integrated/series ratings are utilized. The following information shall be included in the tabulation:
   1. Bus identification number.
   2. Location identification.
   3. Voltage
   4. Manufacturer and type of equipment.
   5. Device rating.
   6. Calculated short-circuit current.

2.3 LOAD-FLOW/VOLTAGE DROP STUDY

A. A load-flow and voltage drop study will be performed to determine the steady-state loading profile of the system. This analysis will be conducted under two modes of operation. The loading under the first mode of operation will be based on the instantaneous load values

collected during the field effort. The loading under the second mode of operation will be based on a 80% design criteria of the loadcenters. From the results of the load-flow/voltage drop calculations, an analysis will be prepared, based on the NEC, to indicate areas of overloaded conductors/loadcenters and areas of excessive voltage drop in the conductors. The load-flow/voltage drop study calculations must be performed using a digital computer utilizing commercially available software.

2.4 ARC FLASH ANALYSIS

A. An arc flash analysis will be performed based on existing short circuit values provided by the customer or in conjunction with a short circuit study. The results from the short circuit study will be used to determine arc energy levels at each defined location in the facility for a specified working distance. Based on the arc energy at each defined point, the proper PPE will be determined and if the arc energy level exceeds available PPE ratings, the locations will be noted. Labels will be provided for each evaluated location that lists the hazard levels along with the required PPE while working in that area. Analysis will be provided to determine if any changes can be made in protection system to reduce arc energy levels.

2.5 SINGLE-LINE DIAGRAM

A. The final report shall include a multi-color single-line diagram of the electrical distribution system within the scope of the project. The single-line shall include:
   1. Transformer rating, voltage ratio, impedance, and winding connection.
   2. Feeder cable phase, neutral and ground sizes, length of cable, conductor material, and conduit size and type.
   3. Switchgear, switchboards, panelboards, MCC's, fuses, circuit breakers, ATS's and switches continuous current ratings.
   4. Protective relays with appropriate device numbers and CT's and PT's with associated ratios.
   5. Detailed legend indicating device type identification and other significant details.

PART 3 - EXECUTION

3.1 SUMMARY

A. The results of the system studies shall be summarized in a final report.

B. Where required, copies of the final report shall be submitted to the power company for their review and approval. Approved copies or the report shall be submitted to the Design Engineer.

3.2 FIELD SETTINGS

A. The contractor shall engage the manufacturer's service group or alternately a qualified independent testing firm to perform field adjustments of the protective devices as required for placing the equipment in final operating condition. The settings shall be in accordance with the approved short circuit study and protective device evaluation / coordination study.

B. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study, shall be carried out by manufacturer's service group.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Mfg. Company Inc.
5. NSi Industries LLC; TORK Products.
6. Tyco Electronics; ALR Brand.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
5. Programs: As indicated on the drawings.
6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
7. Astronomic Time: All channels.
8. Automatic daylight savings time changeover.
9. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC; TORK Products.
4. Tyco Electronics; ALR Brand.
5. WattStopper.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.

3. Time Delay: Fifteen second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Lutron Electronics Co., Inc.
2. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:
    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Lutron Electronics Co., Inc.
2. Watt Stopper.

2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Corporation.
4. General Electric Company ABB
5. Square D; a brand of Schneider Electric.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. The requirements of the Contract, and General Provisions of Division 26 applies to work in this section. Panelboards as Specified and as shown on the contract drawings shall be furnished and installed by the Contractor.

1.2 RELATED DOCUMENTS

A. Related Sections include the following:
   1. Section 26 28 16 - Enclosed Switches and Circuit Breakers
   2. Section 26 09 23 - Lighting Control Devices

1.3 SUBMITTALS

A. The manufacturer shall provide the following information for review and evaluation by the Engineer:
   1. Shop Drawings showing circuit breaker or fusible switch layout, dimensions, voltage, phasing, continuous current capacity, and short circuit rating.
   2. Conduit entry location, cable termination sizes, mounting.

B. Manufacturer shall provide final, as- built drawings, recording the actual circuiting of panels. Installation, Operation and Maintenance manuals shall be supplied.

1.4 RELATED STANDARDS

A. The panelboards and circuit protection devices shall be manufactured and tested according to the latest applicable standards of the following agencies:
   1. UL 50, Enclosures and Electrical Equipment
   2. UL 67, Panelboards
   3. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
   4. UL 943, Ground Fault Circuit Interrupters
   5. NEMA PB1, Panelboards
   6. NEMA PB1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.
   7. NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches
   8. Federal Spec W-P 115, Rev. C, Panel, Power Distribution
   9. ANSI/NFPA 70, National Electrical Code
   10. ANSI/NEMA KS1, Enclosed and Miscellaneous Distribution Equipment Switches (600V)
   11. Manufacturer Seismic Qualification: The low voltage panelboard(s) shall meet and be certified to seismic requirements specified in the IBC 2009 International Building Code.

1.5 QUALITY ASSURANCE

A. The Panelboard manufacturer shall also be the manufacturer of the circuit breakers and fusible switches.

B. Manufacturer shall have produced similar electrical equipment for a minimum period of 10 years.

C. Products shall be listed by Underwriters Laboratories, Inc.

1.6 DELIVERY, STORAGE AND HANDLING

A. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manuals. One (1) copy of this document to be provided with the equipment at time of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The panelboards shall be as manufactured by Siemens Inc

2.2 COMPONENTS

A. Panelboards shall be as shown on the drawings. Refer to drawings for details regarding location of components, voltage and current rating of devices and other required details. Suitable for use as Service Entrance given compliance with NEC.

B. Lighting And Appliance Panelboards (Standard)
   1. Furnish Square D, Type NF/QO.
   2. NEMA PB 1, circuit breaker type.
      a. Standard Lighting and Power Panels
         1.) Main Lug Panels to be rated as indicated on the drawings. Main lugs shall be lay-in construction for panels up to 250 amps to facilitate connections.
         2.) Main Circuit Breaker panels to be rated as indicated on the drawings.

C. Power Distribution Panels
   1. Furnish Square D, type QMB or I-Line panelboards.
   2. NEMA PB 1, circuit breaker or fusible switch type.
      a. Distribution Panels
         1.) Main lug panels shall be rated as indicated on the drawings.
         2.) Main breaker panels shall be rated as indicated on the drawings.

D. Bussing
   1. Copper sized in accordance with UL 67 standards for temperature rise.

E. Ground Bars
   1. A non-insulated copper equipment ground bar will be provided.

F. Neutrals
   1. Neutral bussing shall have a lug for each outgoing branch requiring a neutral connection; load side neutral connection lugs to be split with each side taking 50% of load neutral connections.

G. Features
   1. Standard lighting panels shall be field convertible from Main Lug to Main Breaker with no increase in panel height. Field-addable mains (bussed connected) sub-feed breaker or feed-thru lug kits shall also be available, without utilizing any branch circuit space.
   2. Interior shall be changeable from top to bottom feed and vice-versa, while maintaining readability of dead- front labeling on standard lighting and power distribution panels.

H. Enclosure
   1. Boxes shall be fabricated from galvanized, galvaneal steel or protected against corrosion per the requirements of NEMA 250 and UL 50. Box or panel interior shall have adjustable screws to provide easy alignment for flush mounted applications. Removable end walls to be with KO's.
   2. Surfaces of the trim shall be properly cleaned and painted gray ANSI 61.

I. Trims
   1. Trims for Lighting and Power distribution shall be as indicated on the drawings. It shall be fabricated from cold-rolled steel, painted with an ANSI-61 light gray finish and equipped with concealed hinges, flush lock and circuit directory cardholder. Trim shall have two separate supports designed to engage the box flange to stabilize and secure the trim

during installation. Trim screws to be located behind the lockable door for tamper resistance. Trims for lighting panelboards shall be “hinged to box”, door in door.

2. Trims for Distribution Panels shall be as indicated on the drawings. It shall be fabricated from cold-rolled steel, painted with an ANSI-61 light gray finish.

J. Circuit Breakers

1. Molded case circuit breakers shall be bolt-on devices. Short circuit rating shall be amperes symmetrical based on an integrated equipment short circuit rating and as shown on the drawings, but not less than 10kaic at 240 VAC or 14kaic at 480 VAC. Molded case circuit breaker shall be of the quick-make, quick-break, trip-free, thermal magnetic type. Breaker ratings shall be as shown on the drawings.
2. Molded case circuit breakers shall be thermal-magnetic, quick-make, quick-break, trip free. Multi-pole breakers shall be common trip. Main breakers to be bus-connected to main bus bar and horizontally mounted.
3. Provide circuit breaker accessories as indicated on the drawings or panel schedules.
4. Provide SWD rated breakers for all lighting branch circuits and UL Listed Type HACR for all air conditioning equipment branch breakers.

K. ARC FLASH

1. Apply in the field, the factory supplied arc flash warning label to all panelboards that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized to warn qualified persons of potential electrical arc flash hazards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer’s recommendations and contract documents.

B. Install units plumb, level and rigid without distortion

3.2 ADJUSTMENTS AND CLEANING

A. Remove debris from panelboards and wipe dust and dirt from all components.

B. Repaint marred and scratched surfaces with touch up paint to match original finish.

3.3 TESTING

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture’s recommendations.

B. Check all installed panels for proper grounding, fastening and alignment.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.0 SECTION INCLUDES

A. Specification grade wiring devices, including:
1. Wall switches.
2. Wall dimmers.
3. Receptacles.
4. Floor mounted service fittings.
5. Device plates and box covers.

1.1 RELATED SECTIONS

A. Section 26 05 33 – Raceways and Boxes for Electrical Systems.

1.2 REFERENCES

A. NEMA WD 2 - Semiconductor Dimmers for Incandescent Lamps.

1.3 SUBMITTALS

A. Furnish samples upon request of A/E.

PART 2 - PRODUCTS

2.0 MANUFACTURERS

A. Switches and Receptacles:
1. Hubbell.
2. Leviton.
3. Pass & Seymour.
4. Or equal.

B. Cover Plates: Match device manufacturer.

C. Floor Mounted Service Fittings:
1. Hubbell.
2. Wiremold.
3. Steel City.
4. Or equal.

2.1 DEVICE COLOR

A. Provide finish colors for switches, dimmers, and receptacles as selected by Architect.

2.2 SWITCHES

A. 20A, 120-277V Single Pole: "1221", Hubbell, or equal.

B. 20A, 120-277V Double Pole: "1222", Hubbell, or equal.

C. 20A, 120-277V Three Way: "1223", Hubbell, or equal.

D. 20A, 120-277V Four Way: "1224", Hubbell, or equal.

E. 20A, 277V Single Pole with Pilot Light: "1221PL7", Hubbell, or equal.

F. 20A, 120-277V Single Pole, locking type: "1221L", Hubbell, or equal.

2.3 RECEPTACLES

A. 15A, 125V, 2P3W Clock: NEMA 5-15R; "5235", Hubbell, or equal.

B. 20A, 125V, 2P3W Duplex: Tamper resistant, NEMA 5-20R; "SC63H", Hubbell, or equal.

C. 20A, 125V, 2P3W Simplex: NEMA 5-20R; "5361", Hubbel, or equal.

D. 20A, 125V, 2P3W Duplex: NEMA 5-20R; "5362", Hubbell, or equal.

E. 20A, 125V, 2P3W Duplex Ground Fault Interrupting: NEMA 5-20R; "GF5362", Hubbell, or equal.

F. 20A, 125V, 2P3W Duplex Isolated Ground: NEMA IG5-20R; "IG5362", Hubbell, or equal.

G. 20A, 125V, 2P3W Duplex Surge Suppression, Isolated Ground with Light and Alarm: NEMA IG5-20R; "IG5352S", Hubbell, or equal.

H. 20A, 125V, 2P3W Duplex Hospital Grade: NEMA 5-20R; "8300", Hubbell, or equal.

I. 20A, 125V, 2P3W Duplex Hospital Grade, Ground Fault Interrupting: NEMA 5-20R; "GF8300", Hubbell, or equal.

J. 20A, 125V, 2P3W Duplex Hospital Grade, Isolated Ground: NEMA IG5-20R; "IG8300", Hubbell, or equal.

K. 20A, 250V, 2P3W Simplex: NEMA 6-20R; "5461", Hubbell, or equal.

L. 30A, 125V, 2P3W Simplex: NEMA 5-30R; "9308", Hubbell, or equal.

M. 30A, 250V, 2P3W Simplex: NEMA 6-30R; "9330", Hubbell, or equal.

N. 50A, 125V, 2P3W Simplex: NEMA 5-50R; "9360", Hubbell, or equal.

O. 50A, 250V, 2P3W Simplex: NEMA 6-50R; "9367", Hubbell, or equal.

P. Flush Floor Fittings (Above Grade):
   1. Multiple service, power and communications:

a. Aluminum carpet flange and thermoplastic lift cover with in-floor assembly and AV floor box.
b. Flange and Cover Color: By Architect.
c. Product: Wiremold RFB9 series, or equal.

2. Furniture Feed Outlet:
a. Aluminum carpet flange with poke-through assembly and junction box.
b. Flange and Cover Color: By Architect.
c. Product: "PT7-FF", Hubbell, or equal.

2.4 COVER PLATES

A. Provide one piece cover plates for all group mounted devices.

B. Provide satin smooth, nylon wall plates.

C. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers, for all exterior locations.

D. Exposed Box Cover Plate: Stamped steel handy box covers.

PART 3 - EXECUTION

3.0 INSTALLATION

A. Install receptacles and switches only in electrical boxes which are clean and free from excess building materials, debris, etc.

B. Install wall switches with OFF position down.

C. Where switches and other devices are mounted at one location, provide single coverplate to cover all devices. Where switches are located with dimmers, switches shall match dimmers.

D. Align the tops of all group mounted devices. Install plumb and aligned in the plane of the wall.

E. Derate ganged dimmers as instructed by manufacturer; do not use common neutral.

F. Install convenience receptacles in vertical position with grounding pole on bottom unless otherwise noted.

G. Provide ground fault circuit interrupting type devices in all locations requiring weatherproof devices.

H. Do not use feed through feature for ground fault interrupting devices. Install GFI device at each location. GFI circuit breaker will not be acceptable.

I. Install plates on all devices and blank outlets in finished areas. Use jumbo size plates for outlets installed in masonry walls.

J. Install galvanized steel plates on outlets in unfinished areas.

K. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings.

L. Mounting Heights:
1. Refer to drawing legend sheet or contact A/E.
2. Convenience receptacles above counter or Backsplash: Refer to architectural drawings and/or elevations.
3. Receptacles for Water Coolers: Mount directly behind water cooler to eliminate visibility of cord and attachment plug. Coordinate elevation with the cooler to be installed prior to installation of box.
4. Install devices in mill work as shown in details and elevations or as directed by A/E.

M. Provide red receptacles for circuits on emergency. Provide red cover plates engraved EMERGENCY and engraved with panel designation and circuit number.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fuses and spare fuse cabinet.

1.2 REFERENCES

A. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 DESIGN REQUIREMENTS

A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for components such as wire, cable, bus structures, and other equipment. Design system to ensure that component damage is within acceptable levels during a fault.

B. Select fuses to coordinate with time-current characteristics of other overcurrent protective elements, such as other fuses, circuit breakers, and protective relays. Design system to ensure that device closest to fault operates.

1.4 FUSE PERFORMANCE REQUIREMENTS

A. Main Service Switches Larger than 600 amperes: Class L (time delay).

B. Power Load Feeder Switches: Class RK1 (time delay).

C. Motor Load Feeder Switches: Class RK1 (time delay).

D. Other Feeder Switches Larger than 600 amperes: Class L (time delay).

E. Other Feeder Switches: Class RK1 (time delay).

F. General Purpose Branch Circuits: Class RK1 (time delay).

G. Motor Branch Circuits: Class RK1 (time delay).

H. Lighting Branch Circuits: Class G.

1.5 SUBMITTALS

A. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

B. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 MAINTENANCE MATERIALS

A. Provide two fuse pullers.

1.8 EXTRA MATERIALS

A. Supply three spare fuses of each Class, size, and rating installed.

PART 2 - PRODUCTS

2.1 FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.2 CLASS RK1 (TIME DELAY) FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.3 CLASS RK1 (NON-TIME-DELAY) FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.4 CLASS RK5 FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.5 CLASS J (TIME DELAY) FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating:

2.6 CLASS J (NON-TIME-DELAY) FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.7 CLASS L (TIME DELAY) FUSES

A. Manufacturers:
1. Bussman.
2. Shawmut.
3. Or equal.

B. Dimensions and Performance: NEMA FU 1.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

D. Short Circuit rating: 200,000 AIC.

2.8 SPARE FUSE CABINET

A. Wall-mounted sheet metal cabinet with shelves, suitably sized to store spare fuses and fuse pullers specified.

B. Doors: Hinged, with hasp for Owner's padlock.

C. Finish: Gray enamel.

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Remove fuses from abandoned circuits.

B. Ensure access to existing fuses and other installations which remain active and which require access. Modify installation or provide access panel as appropriate.

3.2 INSTALLATION

A. Install fuse with label oriented such that manufacturer, type, and size are easily read.

B. Install spare fuse cabinet where indicated.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.

5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Square D.
2. General Electric Company.
3. Eaton / Cutler-Hammer.

4. Siemens.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment, where indicated.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Siemens Energy & Automation, Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Siemens Energy & Automation, Inc.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

F. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

H. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

I. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Explosion-proof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Short Circuit Current Analysis and Coordination Study."

END OF SECTION

SECTION 26 32 13

PACKAGED ENGINE GENERATOR SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator systems, including:
1. Packaged engine generator set.
2. Battery and charger.
3. Cooling system.
4. Control system and accessories.
5. Exhaust silencer and fittings.
6. Fuel lines, fittings, day tank and fuel pumps.
7. Weatherproof enclosure.

1.2 RELATED SECTIONS

A. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

B. Section 26 01 26 - Electrical Testing.

C. Section 26 36 00 - Automatic Transfer Switches.

1.3 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum).

1.4 SYSTEM DESCRIPTION

A. Provide gaseous-fueled engine generator system to provide source of continuous standby power.

B. System Capacity: As scheduled on Drawings at elevation of up to 1,000 feet above sea level and ambient temperature between 0 degree and 110 degrees F continuous rating.

C. Generator set and components must fit in available space indicated with proper clearance and operate with the free air space indicated.

1.5 SUBMITTALS

A. Furnish shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams. Show actual room layout and verify combustion air requirements and cooling water requirements.

B. Furnish product data showing dimensions, weights, ratings, interconnection points and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery

charger, exhaust silencer, vibration isolators, and remote annunciator. Submit computer analysis for generator loading, motor starting, critical speed and vibratory stress.

C. Furnish manufacturer's installation instructions.

D. Provide operation and maintenance manual. Furnish instructions for normal operation and emergency operation.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in packaged gaseous-fueled engine generator system and with staff engineers factory trained by manufacturer of synchronizing switchgear.

B. Supplier Qualifications: Authorized distributor of engine generator manufacturer with staffed service facilities within 50 miles of project site.

1.7 MAINTENANCE SERVICE

A. Submit prospective contract for service and maintenance of packaged engine generator system for one year from date of substantial completion. Include a minimum of two visits at six month intervals exclusive of warranty work.

B. Do not include cost of maintenance service in bid. Maintenance agreement will be in a separate contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cummins Onan

2.2 ENGINE SPECIFICATIONS

General

EPA Emissions Compliance	Stationary Emergency
Cylinder	4
Type	Inline
Pistons	Aluminum
Crankshaft	Ductile Iron

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full-flow cartridge

Cooling System

Cooling System Type	Pressurized Closed Recovery
Water Pump Flow	24 gal/min
Fan Type	Pusher
Coolant Heater Wattage	1200
Coolant Heater Standard Voltage	120 VAC

Fuel System *

Fuel Type	Natural Gas
Carburetor	Down Draft
Secondary Fuel Regulator	Standard
Fuel Shut Off Solenoid	Standard
Operating Fuel Pressure	11” – 15” H2O

*Fuel pressure must remain within specified range and not drop more than 1in. w.c. from static (no-load) to full load.

Engine Electrical System

System Voltage	12VDC
Battery Charging Alternator (Amps)	Standard
Battery Size	1155 CCA
Battery Group	8D
Battery Voltage	(1) 12VDC
Ground Polarity	Negative

2.3 ALTERNATOR SPECIFICATIONS

General

Poles	4
Field Type	Revolving
Insulation Class – Rotor	H
Insulation Class – Stator	H
Total Harmonic Distortion	Less than 5%
Telephone Interference Factor (TIF)	Less than 50
Standard Excitation	Permanent Magnet
Bearings	Sealed Ball
Coupling	Direct, Flexible Disc
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Full Digital
Regulator Accuracy (Steady State)	+/- 0.25%

Engine Governing

Governor	Electronic
Frequency Regulation (Steady State)	+/- 0.25%

2.4 ENGINE ACCESSORIES

A. General:

1. Lube oil filter, intake air filter, fuel transfer pump, fuel priming pump, water pump.

B. Mounting: Provide unit with suitable pad-type vibration isolators and mount on structural steel base.

C. Weather-Protective Housing: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include fixed louvers, not less than 14 gage sheet metal for housing walls, battery rack and silencer.

D. Exhaust Silencer: Critical, spark arresting type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for orientation, as indicated on the drawings, and sized in accordance with engine manufacturer's instructions. Provide screen and terminal adapter.

E. Battery Charger: Current limiting type. Include overload protection, full wave rectifier, DC voltmeter and ammeter and 120 volt AC fused input. Provide battery charger mounted within generator enclosure. Enclosure to meet NEMA 250, Type 1, requirements. Charging rate minimum of ten (10) amperes with capacity to recharge battery unit within six hours.

F. Engine-Generator Control Panel: Control panel shall be mounted within lockable generator enclosure, with the following engine and generator controls and indicators:
1. Frequency.
2. AC Output: Voltage.
3. AC Output: Amperage.
4. Output voltage adjustment.
5. Engine start/stop selector switch.
6. Engine running time.
7. Oil pressure.
8. Water temperature.
9. Auxiliary Relay: Three pole double throw, operates when engine runs, with contact terminals pre-wired single pole double throw contact to terminal strip.
10. Remote Alarm Contact: Prewired single pole double throw contact to terminal strip for remote alarm functions required by NFPA 99.

G. Supply engine protective devices as follows:
1. Alarm system for high water temperature and/or low oil pressure.
2. Engine overspeed shutdown device.
3. Indicating light for use with the above protective systems.

H. Remote Engine Annunciator Panel:
1. Engine run charger failure.
2. High coolant temperature.
3. Low oil pressure.
4. Overcrank and overspeed.
5. Low fuel indicator lights.
6. Surface mounted panel with painted finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide 4-inch concrete housekeeping pad.

C. Install remote annunciator in building security command center as indicated. Provide all interconnecting wiring.

D. Coordinate all work necessary for a complete working standby generating system, including fuel lines, fuel tanks, and piping.

3.3 FIELD QUALITY CONTROL

A. Provide services of authorized manufacturer's technician to start, test, and adjust system for proper operations.

B. Provide services of factory trained and authorized technician to give Owner an eight-hour class in proper operation and maintenance of engine generator systems.

3.4 CLEANING

A. Clean engine and generator surfaces. Replace oil and fuel filters.

3.5 DEMONSTRATION

A. Provide system demonstration to A/E.

B. Simulate power outage by interrupting normal source and demonstrate that system operates to provide power; that all controls are operative and that units operate satisfactorily in the event of interruption of normal power.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.
5. Retrofit kits for fluorescent lighting fixtures.

B. Related Sections:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.
2. Section 262726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Lumen: Measured output of lamp and luminaire, or both.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast, including BF.
4. Energy-efficiency data.

5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches (305 mm) of the plane of the luminaires.
4. Structural members to which suspension systems for lighting fixtures will be attached.
5. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Furnish at least one of each type.
2. Plastic Diffusers and Lenses: Furnish at least one of each type.
3. Fluorescent-fixture-mounted, emergency battery pack: One for every emergency lighting unit.
4. Ballasts: Furnish at least one of each type.
5. Globes and Guards: Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
    b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

    a. "USE ONLY" and include specific lamp type.
    b. CCT and CRI for all luminaires.

I. LED Luminaires: UL listed and manufactured in strict accordance with the appropriate and current requirements of the “Standards for Safety” to UL 8750 or others as they may be applicable. Each luminaire shall consist of an assembly that utilizes LED’s as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
      g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

   3. Master/Remote Sign Configurations:

      a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity for power connection to remote unit.
      b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

2.4 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

   1. Battery: Sealed, maintenance-free, lead-acid type.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay

disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
7. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 LED LUMINAIRES

A. General Requirements:
   9. Luminaire shall be designed for a minimum operational life of 50,000 hours. Operating range shall be from 0 to +25 degree C.
   10. The individual LEDs shall be connected such that a catastrophic loss or failure of one LED will not result in the loss of the entire luminaire.
   11. LED boards shall be suitable for field maintenance or service with quick disconnect plugs from below the ceiling.

B. Technical Requirements:
   1. Power consumption: Maximum power consumption of +/- 5% when operating between 120V – 277V.
   2. Operational voltage: The luminaire shall operate from a 50 or 60 HZ, +/-3HZ AC line over a voltage range from 120VAC to 277VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
   3. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
   4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20% at any standard input voltage.
   5. Surge Suppression: The luminaire shall include surge suppression to withstand high repetition noise and other interference. Surge suppression shall comply with the requirements of ANSI/IEEE C62.41.
   6. Driver: AccuDrive, 120-277 volt, UL listed and certified, sound rated A+. Driver shall be greater than 80% efficient at full load across all input voltages. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker.

C. Photometric Requirements:
   1. Light Output: The minimum initial lumen output shall be as measured by IESNA Standard LM-79-08.
   2. Correlated Color Temperature (CCT) shall be as scheduled.
   3. The color rendition index (CRI) shall be 80 or greater.

D. Physical Requirements:
   1. The luminaire shall be a single, self-contained device, not requiring onsite assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.
   2. The luminaire shall have a UL / IC rating.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

D. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

E. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires**,** independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.
4. Luminaire lowering devices.

B. Related Sections:

1. Section 265100 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, including ballast housing if provided.

E. Pole: Luminaire support structure, including tower used for large area illumination.

F. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf (2224 N), distributed as stated in AASHTO LTS-4-M.

C. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photoelectric relays.
7. Drivers, including energy-efficiency data.
8. LED, including life, output, CCT, CRI, lumens, and energy-efficiency data.
9. Materials, dimensions, and finishes of poles.
10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.
12. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch (6 mm) deep. Do not apply tools to section of pole to be installed below ground line.

D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

E. Exposed Hardware Material: Stainless steel.

F. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

G. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

H. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

J. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

K. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
    a. Color: As selected by Architect from manufacturer's full range.

L. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

    a. Color: As selected by Architect.

M. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

    a. "USES ONLY" and include specific lamp type.
    b. CCT and CRI for all luminaires.

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 LED LUMINAIRES

A. General Requirements:
1. Luminaire shall be designed for a minimum operational life of 50,000 hours. Operating range shall be from 0 to +25 degree C.
2. The individual LEDs shall be connected such that a catastrophic loss or failure of one LED will not result in the loss of the entire luminaire.
3. LED boards shall be suitable for field maintenance or service with quick disconnect plugs from below the ceiling.

B. Technical Requirements:
1. Power consumption: Maximum power consumption of +/- 5% when operating between 120V – 277V.

2. Operational voltage: The luminaire shall operate from a 50 or 60 HZ, +/-3HZ AC line over a voltage range from 120VAC to 277VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
3. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20% at any standard input voltage.
5. Surge Suppression: The luminaire shall include surge suppression to withstand high repetition noise and other interference. Surge suppression shall comply with the requirements of ANSI/IEEE C62.41.
6. Driver: AccuDrive, 120-277 volt, UL listed and certified, sound rated A+. Driver shall be greater than 80% efficient at full load across all input voltages. Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker.

C. Photometric Requirements:
1. Light Output: The minimum initial lumen output shall be as measured by IESNA Standard LM-79-08.
2. Correlated Color Temperature (CCT) shall be as scheduled.
3. The color rendition index (CRI) shall be 80 or greater.

D. Physical Requirements:
1. The luminaire shall be a single, self-contained device, not requiring onsite assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.
2. The luminaire shall have a UL / IC rating.

2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.6 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209 (ASTM B 209M), 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Shape: As indicated.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as luminaire.

F. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

G. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

a. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming: Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches (1520 mm) .
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet (3 m).
3. Trees: 15 feet (5 m) from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

    a. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
    b. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
    c. IESNA LM-64, "Photometric Measurements of Parking Areas."
    d. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

END OF SECTION

SECTION 270000
COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general design requirements, administration topics, and installation for communications systems.

1.2 SYSTEM DESCRIPTION

A. The objective of this project is to provide a complete communications cabling infrastructure system installation including, but not limited to: fiber backbone, riser system, horizontal data and voice cabling with attendant terminations, mounting equipment, cable pathway and management systems, testing and other items/materials, as specified in drawings, these specifications, and contract documents.

B. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270526 Grounding and Bonding for Communications Systems
3. Section 271500 Communications Horizontal Cabling
4. Section 280000 Electronic Security (including related sub-sections)

1.3 SCOPE OF WORK

A. This section establishes an infrastructure to be used as signal pathways for communications systems, but is not limited to the following:

1. Comply with all Project Contract documents and the following requirements for a complete project installation.
2. Provide a structured cabling system as described hereafter that includes, but is not limited to, supplying, installing and testing of: data and voice horizontal cabling, cable connectors, communications outlets and terminations, and equipment racks/cabinets for networking hardware and patch panels.
3. Furnish all labor, materials, tools, equipment and services for the installation described herein.
4. Follow industry standard installation procedures for communications cable to assure that the mechanical and electrical transmission characteristics of this cable plant and equipment are maintained.

B. Work of this section covers complete installation of permanent links for a data communications networks utilizing copper transmission media that includes, but is not limited to the following:

1. Provide, install, terminate, test, and document all copper horizontal cables.
2. Provide and install all termination devices such as, but not limited to, modular patch panels, termination blocks, information outlets (jacks and plates), phone jacks, fiber distribution panels, bulkheads, connectors, and fiber fan out kits. Document all termination devices with proper labeling.
3. Provide in quantities specified, interconnect components such as, but not limited to, copper patch cords, and station cables.
4. Provide and install specified Telecommunication Room equipment such as, but not limited to, cabinets, horizontal and vertical cable support devices, cable trays and cable runway, and required mounting brackets/hardware.
5. Provide and install UL-approved firestopping systems in all communication pass-through locations of rated ceiling, wall or floor penetrations involving, conduits, cable, in coordination with General Contractor.
6. Provide and install grounding and bonding connection to the bus (PBB/SBB) provided by Division 26.
7. Provide and install all appropriate consumable items required to complete the installation.
8. Coordination with other trades.
9. Provide complete documentation and demonstration of work.
10. Provide indexed and organized complete Test Results of all copper and fiber cable and their components in native format.
11. Provide Submittals as outlined below.
12. Provide a Manufacturer’s Extended Product Warranty and System Assurance Warranty for this wiring system.
13. Conduct a final document handover meeting with client, consultant, and PM to review, discuss and educate the Owner on the final product, test results, and As-Built Drawings.

C. Changes to the Scope of Work

1. The owner changes to the scope of work shall be in writing.
2. Change orders shall be submitted to the Owner/Project Manager complete with price breakdown and description for approval before any work is done.
3. The Contractor shall respond to these changes with a complete material list, including pricing, labor, and taxes in writing to be presented to the Owner for approval.
4. The Contractor shall not proceed with additional scope of work without signed approval by the Owner. Owner will not pay for additional work performed by the Contractor without written/signed approval of these changes.
5. The contractor will attach a copy of the signed change order with billing information.

1.4 PRODUCTS AND WORK BY OTHERS (NIC)

A. The Owner may separately procure and/or provide certain equipment and components that will be installed during the project. Such items may not be indicated in the documents.

1.5 SUBSTITUTION PROCEDURES

A. Substitution may be considered when a product becomes unavailable through no fault of the Contractor. An alternate product must be equal to or exceed specified requirements. The material substituted shall not void, alter or change manufacturers' structured cabling system warranty.
B. Document substitution requests with complete data substantiating compliance of proposed substitution with Contract Documents. Include in each request for substitution:

1. Product identification, manufacturer's name and address.
2. Product Data:

a) Description, performance and test data, reference standards, finishes and colors.
b) Samples: Finishes.
c) Complete and accurate drawings indicating construction revisions required (if any) to accommodate substitutions.
d) Data relating to changes required in construction schedule.
e) Cost comparison between specified and proposed substitution.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
D. The Owner will be the final judge of acceptability, with review by DataCom Design Group and the distribution of the acceptance by the Architect.
E. No substitute shall be ordered, installed or utilized without the Architect's prior written verification of acceptance from the Owner.

1.6 REFERENCES AND RELATED DOCUMENTS

A. Drawings and General provisions of the contract, including Uniform General Conditions, Supplementary General Conditions, Architectural plans and specifications, requirements of Division 1, Electrical, Mechanical, Plumbing, Security and Communications specifications and plans, and the publications listed below apply to the Communications section, are incorporated into this specification by reference, and shall be considered a part of this section.

B. Reference to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean reference to the latest printed edition of each in effect at the date of the contract.
C. The Contractor shall read all sections in their entirety and apply them as appropriate for work in this section.
D. Conflicts

1. Drawings and specifications are to be used in conjunction with one another and to supplement one another.

a) In general, the specifications determine the nature and quality of the materials and tests, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to during the installation of the communications system components.

2. If there is an apparent conflict between the drawings and specifications, or between specification sections, the items with the greater quantity and/or quality shall be estimated and installed.
3. Clarification with the Owner and/or DataCom Design Group about these items shall be made in writing prior to procurement and installation.

E. Codes and Standards

1. American National Standards Institute/Telecommunications Industry Association (ANSI/TIA)

a) ANSI/TIA-568.0-D "Generic Telecommunications Cabling for Customer Premises"
b) ANSI/TIA-568.1-D "Commercial Building Telecommunications Infrastructure Standard"
c) ANSI/TIA-568.2-D "Balanced Twisted-Pair Telecommunication Cabling and Components Standard"
d) ANSI/TIA-568.3-D "Optical Fiber Cabling Components Standard"
e) ANSI/TIA-568.4-D "Broadband Coaxial Cabling and Components Standard"
f) ANSI/TIA-569-D "Telecommunications Pathways and Spaces"
g) ANSI/TIA-606-C "Administration Standard for Commercial Telecommunications Infrastructure"
h) ANSI/TIA-607-C "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications"
i) ANSI/TIA-862-B "Building Automation Systems Cabling Standard"
j) ANSI/TIA-942-A: "Telecommunications Infrastructure Standard for Data Centers"
k) ANSI/TIA-1152-A: "Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling"

2. BICSI

a) BICSI Outside Plant Design Reference Manual
b) BICSI Telecommunications Distribution Methods Manual (TDMM)

3. National Electrical Code (NEC)

a) NEC Article 250 - Grounding and Bonding
b) NEC Chapter 8 - Communications Systems

4. National Electrical Manufacturers Association (NEMA)

a) NEMA RN1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
b) NEMA TC2 Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
c) NEMA TC3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

5. Local, county, state and federal regulations and codes in effect as of date of installation.
6. Equipment of foreign manufacture must meet U.S. codes and standards.

a) It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.7 QUALITY ASSURANCE

A. Communications Contractor shall have a complete working knowledge of low voltage communications cabling applications such as, but not limited to data, voice and video network systems.
B. Communications Contractor shall have installed similar-sized systems in at least ten (10) other projects in the last five (5) years prior to this bid and be regularly engaged in the business of installation of the types of systems specified in this document.
C. Communications Contractor and individual installation crew members shall be experienced and qualified to perform the work specified herein at the time of bid submission. All onsite supervision personnel that will be assigned to this project shall be listed in the Pre-Installation Submittal.

1. 80% shall have a minimum of three (3) years of experience in the installation of the types of systems, equipment, and cables specified in this document prior to this bid.
2. All installation team members must demonstrate knowledge and compliance with all applicable methods, standards, and codes.
3. All members of the installation team shall be certified by the Structured Cabling System Assurance Warranty provider as having completed the necessary training to complete their part of the installation and capable of an

installation that falls under manufacturer's guidelines necessary to obtain the Manufacturer's System Assurance Warranty.

4. Any personnel substitutions shall be noted in writing to the Owner.

D. A BICSI RCDD or PM shall supervise and approve all on-site work as a recognized member of the Contractor's installation team.

E. Refer also to General Conditions.

1.8 CONTRACTOR REQUIREMENTS

A. To accomplish the conditions of this agreement, the Contractor shall perform the specific duties listed herein.

B. Contractor shall provide and pay for all labor, supervision, tools, equipment, test equipment, tests and services to provide and install a complete communications cabling infrastructure system. Pay all required sales, gross receipts, and other taxes.

C. Regulatory Requirements

1. Communications Contractor shall supply all city, county, and state telecommunication cabling permits required by Authority Having Jurisdiction (AHJ).
2. Communications Contractor shall be licensed and/or bonded as required for telecommunications/low voltage cabling systems.

D. Use of Subcontractors

1. Successful bidder shall inform the Owner's contact and General Contractor in writing about the intention to use Subcontractors and the scope of work for which they are being hired.
2. The Owner or Owner's designated contact must approve the use of Subcontractors in writing prior to the Subcontractor's hiring and start of any work.

E. The Contractor's designated Project Manager will be recognized as the single point of contact. The Project manager shall oversee all work performed to ensure compliance with specifications as outlined in bid documents (which includes all specifications, references, and drawings) to ensure a quality installation and attend project meetings with the telecommunication consultant, the Owner and others.

F. Coordination

1. Coordinate installation work with other trades (examples include ceiling grid contractors, HVAC and sheet metal contractors, etc.) to resolve procedures and installation placement for cable trays and cable bundle pathways.

2. The goal of this coordination will be to establish priority pathways for critical data/voice network cable infrastructure, materials, associated hardware, as well as mitigate delays to the project and to allow service access for communications and HVAC components.
3. Exchange information and agree on details of equipment arrangements and installation interfaces.
4. Coordinate with electrical contractors and plan for the pathway routes used communications cabling to minimize cable lengths. Report any potential over distance cable runs for approval before pulling the cables.
5. Record agreements with other trades and distribute record to other participants, Owner and telecommunication consultant.

1.9 PRE-INSTALLATION MEETINGS

A. The Communications Contractor shall attend and/or arrange a scheduled pre-installation conference prior to beginning any work of this section. This venue is to ask and clarify questions in writing with consultant and/or project manager/Owner representative.

B. Agenda

1. Safety
2. Work to be performed
3. Scheduling
4. Coordination
5. Other topics as necessary

C. Attendance

1. The Communications project manager/supervisor shall attend meetings arranged by General Contractor, Owner’s representatives, and other parties affected by work of this document.
2. All individuals who will serve in an on-site supervisory capacity, including project managers, site supervisors, and lead installers, shall be required to attend the pre-installation conference. Individuals who do not attend the conference will not be permitted to supervise the installation and testing of communications cables on the project.

1.10 CONTRACT ADMINISTRATION

A. DataCom Design Group may perform site visits and provide job field reports upon inspection of Contractor's installation, materials, supporting hardware, coordination with other trades and progress to schedule to the client.

B. Job Field Report outline:

1. General: The general installation progress in relation to scheduled work made by the Contractor up to that date.
2. Deficiencies and/or Items of Note: Documents observations of the cable installation that may require corrective action by the Contractor.

1.11 POST INSTALLATION MEETINGS

A. At the time of substantial completion, the contractor shall call and arrange for a post installation meeting to present and review all submittal documents to include but not be limited to As-Built Drawings, Test reports, Warranty paperwork, etc.
B. Attendees shall include

1. Communications Contractor
2. Project Manager/Owner Representative
3. DataCom Design Group
4. General Contractor
5. Other trades that the GC deems appropriate.

C. At this meeting the Communications Contractor shall present and explain all documentation.
D. Any discrepancies or deviations noted by and agreed to by participants shall be remedied by the Communications Contractor and resubmitted within one (1) week of the meeting.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Coordination with delivery companies, drivers, site address, and contact person(s) will be the responsibility of the Contractor.
B. Communications Contractor requirements:

1. Be responsible for prompt material deliveries to meet contracted completion date.
2. Coordinate deliveries and submittals with the General Contractor to ensure a timely installation.
3. No equipment materials shall be delivered to the job site more than three weeks prior to the commencement of its installation.
4. Equipment shall be delivered in original packages with labels intact and identification clearly marked.
5. Equipment shall not be damaged in any way and shall comply with the manufacturer’s operating specifications.
6. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.
7. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.

8. Contractor shall be responsible for all handling and control of equipment. Contractor is liable for any material loss due to delivery and storage problems.

1.13 PROJECT/SITE CONDITIONS

A. Contractor shall provide daily a clean work environment that is free from trash/rubbish accumulated during and after cabling installation.
B. Contractor shall keep all liquids (drinks, sodas, etc.) away from finished spaces. If any liquid or other detriment (cuts, soils, stains, etc.) damages any finishes, Contractor shall provide professional services to clean or repair scratched/soiled finishes, at Contractor's expense.
C. Damage by Communications Contractor to the work of others will be remedied at the Contractor's expense in a timely manner.

1.14 WARRANTY

A. The Contractor shall be a certified Manufacturer's Value-Added Reseller (VAR) and/or Authorized Installer and provide an end-to-end product warranty, adhere to the industry standard engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this project.
B. The contractor shall coordinate with manufacturer for warranty paperwork and procedures prior to the start of the project.
C. Contractor shall provide a minimum one (1) year warranty on installation and workmanship PLUS an Extended Product Warranty and System Assurance Warranty for this wiring system and shall commit to make available local support for the product and system during the Warranty period.

    1. The Extended Product Warranty shall apply to all passive structured cabling system components and shall cover the replacement or repair of defective products and labor for the replacement or repair of such defective products for a minimum of one (1) year.
    2. The System Assurance Warranty provides a complete system and product warranty that will be extended to the end-user, ensuring the structured cabling system will be free of defects in materials and workmanship, will meet or exceed applicable performance requirements defined in the contract documents, and support all current and future network applications for a minimum of twenty (20) years.

D. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturer, registering the installation.

1.15 PAYMENT

A. Refer to the General Contractor contract documents and/or master specifications issued by Architect for project and cost payment details.

1.16 SUBMITTALS

A. Refer to Requirements of Division 1.
B. Refer to Sections 271300 and 271500.
C. The Communications Contractor shall not perform any portion of the work requiring submittal and review of shop drawings, product data, or samples until Owner has approved the respective submittal in writing. Such work shall be in accordance with approved submittals.
D. Pre-Installation Submittal Requirements

1. Communications Contractor shall provide certificates for the appropriate insurance coverage as defined in contract documents.
2. City, county, and/or state telecommunication cabling permits as required by Authority Having Jurisdiction (AHJ).
3. Executed non-disclosure agreement.
4. Appoint a Project Manager and provide the name and contact information.
5. Shop Drawings

    a) Communications Contractor shall submit, for approval, floor plans that identify all device locations, cable routes, cable lengths, cable quantities and cable types, riser locations, and references to installation details and diagrams.

        1) Communication Contractor shall notify Owner of cable routes exceeding standardized lengths.

    b) Communications Contractor shall submit, for approval, diagrams that show room layouts, rack layouts (including elevations), riser layouts, etc.
    c) The Contractor shall make any corrections as required by the consultant team and submit revised shop drawings to the team for approval.
    d) Approval by the Consultant of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from the drawings or specifications, nor shall it relieve the Contractor from responsibility for errors of any sort in shop drawings or schedules. Requests to deviate shall be submitted in writing to the Architect.

6. Product Data Cut-sheets

a) Communications Contractor shall submit catalogue cut sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection.
b) Communications Contractor shall identify applicable specification section reference for each product performance for each component specified for approval prior to purchase and installation.

7. Warranty

a) The Communications Contractor shall submit appropriate documentation from the certifying manufacturer showing the project is registered and qualified for the System Assurance Warranty.
b) All subsequent work shall be in accordance with approved submittals. The Communications Contractor shall not perform any portion of the work requiring approval of the System Assurance Warranty manufacturer's warranty registration qualification procedures that would disqualify any part or all of the wiring system from that warranty qualification.

8. Qualifications

a) The Communications Contractor shall submit a list of the Contractor's previous projects that demonstrate qualification for this project. This list shall include, but not be limited to:

1) At least ten (10) other projects in the last five (5) years
2) Name and location of project
3) Project contacts, email addresses, and phone numbers
4) Total square footage
5) Total number of cables/drops
6) Types of media

b) Communications Contractor shall submit an up-to-date and valid statement of qualifications for those assigned to perform the work specified herein at time of bid submission.

1) Communications Contractor Employees
2) Subcontractors

c) Manufacturer certifications for Contractor and installers.

9. Cable Testing Plan

a) The Contractor shall provide a complete and detailed test plan for approval of the cabling system specified herein, including a complete list of test equipment for copper and fiber components and accessories prior to beginning cable testing.
b) The following minimal items shall be submitted for review:

1) A testing plan that clearly describes procedures and methods.
2) Product data for test equipment.
3) Certifications and qualifications of all persons conducting the testing.
4) Calibration certificates indicate that equipment calibration meets National Institute of Standards and Technology (NIST) standards and has been calibrated at least once in the previous year of the testing date.
5) Examples of test reports, including all graphs, tables, and charts necessary for display of testing results.

10. Samples

a) For workstation outlet connectors, jack assemblies, housings and faceplates for color selection and evaluation of technical specifications and requirements. Confirm with Architect, interior designer, and Owner representative for color before purchasing materials.

E. Closeout Submittal Requirements

1. As-Built Drawings

a) Communications Design drawings are to be supplied to the Architect to prepare the master “As-Built” drawings.
b) Submit one electronic copy and one hard copy with project deliverables within three (3) weeks after substantial completion. Provide a laminated floorplan with drop designations in the respective serving Telecom Room.
c) As-Built drawings shall be in AutoCAD format, same version as used by Architect and consultant. The dimensions and scale of the drawing sheets submitted shall match the size of the drawing sheets used for the contract documents.
d) Utilize normal recognized drafting procedures that match AutoCAD standards, Architect and Consultant guidelines, and methodology.
e) The As-Built drawings shall incorporate all changes made to the building identified in, but not limited to, addendum, change notices, site instructions or deviations resulting from site conditions.

1) Contractor shall clearly identify any resubmitted drawing sheets, documents or cut sheets either by using a color to highlight or cloud around resubmitted information.
2) Maintain drawing numbering or page/sheet scheme consistency as per previously issued drawings/documents.

f) Provide dimensioned plan and elevation views of networking components, showing:

1) All work area outlet locations are complete with outlet/cable labeling.

2) Rack and/or cabinet locations complete with labeling.
3) One-line diagram of equipment/device interconnections with the cable plant.
4) Standard or typical details of installations unique to Owner’s requirements.

2. The Communications Contractor shall deliver the Installer's Extended Product Warranty and Manufacturer's signed System Assurance Warranty of installed cabling system to include all components that comprise the complete cabling system.

a) Delivery shall be completed within two (2) weeks of the time of final punch list review.
b) Product Certificates shall be signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.

3. Cable Testing Report Requirements

a) Submit certified test reports of Contractor-performed tests. The contractor shall submit the required Test Reports in the format and media specified, upon completion of testing the installed system.
b) The tests shall clearly demonstrate that the media and its components fully comply with the requirements specified herein.
c) Three (3) sets of electronic and hardcopy versions of test reports shall be submitted together and clearly identified with cable designations.
d) Cable inventory data shall be submitted for all fiber, copper, and coaxial cabling and termination components. Include products furnished:

1) Manufacturer's name
2) Manufacturer's part numbers
3) Cable designations
4) Location and riser assignments
5) Product Data

4. Supply Owner with training manuals with instructions on methods of adding or removing cabling to/from firestopped sleeves and chases.

F. The Contractor’s BICSI Registered Communications Distribution Designer (RCDD) supervisor shall review, approve and stamp all documents prior to submitting. The Contractor’s RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein upon completion of all work.

PART 2 - PRODUCTS

2.1 SUMMARY

A. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling products and shall be the manufacturer's latest standard design in satisfactory use for at least one year prior to bid opening.
B. All material and equipment, as provided, should be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufacturing of such products.

    1. All shall be typical commercial designs that comply with the requirements specified.
    2. All material and equipment shall be readily available through manufacturers and/or distributors.

C. All equipment shall be standard catalogued items of the manufacturer and shall be supplied complete with any optional items required for proper installation.
D. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance and backward compatibility.
E. All materials shall be UL- and/or ETL-approved and labeled in accordance with NEC for all products where labeling service normally applies.
F. Materials and equipment requiring UL 94, 149 or 1863 listing shall be so labeled. Modification of products that nullifies UL labels is not permitted.
G. Backward Compatibility: The provided products shall be backward compatible with lower category ratings such that if higher category components are used with lower category components, the basic link and channel measures shall meet or exceed the lower category's specified parameters.
H. Component Compliance: The provided products shall each meet the minimum transmission specifications listed herein such that no individual component will be less than specifications for permanent link and channel, regardless of the fact that tests for link and channel ultimately meet required specifications.

2.2 ACCEPTABLE MANUFACTURERS

A. Identification (Labeling) System

    1. Brady
    2. Dymo
    3. Hellerman-Tyton
    4. Acceptable alternate

B. Fire-Stop Systems

1. Hilti
2. SpecSeal
3. 3M
4. Acceptable alternate

C. Floor mounted Communications Cabinet (28”w x 36”d x 6’h)

1. Chatsworth (CPI)
2. Bline
3. Leviton
4. Panduit
5. Approved Alternate

D. Other Products as Referenced in other Division 27 Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field Measurements

1. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

B. Established Dimensions

1. Where field measurements cannot be made without delaying the work, coordinate with the General Contractor to establish dimensions.
2. When approved in writing, proceed with fabricating units without field measurements.
3. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

C. Pre-installation inspection

1. The Contractor shall visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport.
2. Visibly damaged goods are not acceptable and shall be replaced by the contractor at no additional cost to the Owner.

3.2 INSTALLATION

A. General

1. Contractor shall install work in accordance with specifications, drawings, manufacturer's instructions and approved submittal data.

B. Allowable cable bend radius and pull tension:

   a) In general, communications cables cannot tolerate sharp bends or excessive pull tension during installation.
   b) Refer to cable manufacturer's bend radius recommendations for the maximum allowable limits.
   c) After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Use only lubricants specifically designed for cable installation.

C. Pull Strings

1. Provide pull strings in all new conduits, including all conduits with cable installed (trailer strings) as part of this contract.
2. Data and video cables can be pulled in tandem with pull strings.
3. The pull strings must move freely to prevent cable jacket/cable damage during pulls.

D. Labeling

1. Cable labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.
2. Flat-surface labels: Self-adhesive vinyl or vinyl-cloth labels, machine printed with alphanumeric cable designations.
3. Provide transparent plastic label holders, and 4-pair marked colored labels.
4. In accordance with ANSI/TIA-606-C "Administration Standard for Commercial Telecommunications Infrastructure":

   a) Install colored labels according to the type of field as per color code designations.

5. Pathway Labels and Labeling System

   a) Labeling system shall consist of a hand-held portable printer
   b) Conduits: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive. Label size shall be appropriate for the conduit size. Font size shall be legible from the finished floor.
   c) Inner duct: Polyethylene general-purpose tagging material attached using tie wraps.
   d) Junction boxes: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name. Font size shall be easily visible from the finished floor.
   e) All labels shall be permanent, i.e. will not fade, peel, or deteriorate due to environment or time.
   f) Identification

1) All conduits, junction boxes, gutters, and pull boxes shall have machine-generated labels easily visible from the finished floor.
2) Conduits shall be labeled with the word “communications” and the conduit’s origination room number and destination room number.
3) The Contractor shall label conduit at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other sections.
4) Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by contractor and submitted for approval.
5) The Contractor shall label conduit sleeves at each wall and floor penetration.

E. Firestop

1. Provide approved fire-resistant materials to restore originally designed fire-ratings to all wall, floor, and ceiling penetrations used in the distribution and installation for communications cabling system.
2. Install and seal penetrations (conduit, sleeves, slots, chases) in fire-rated barriers created for communications infrastructure to prevent the passage of smoke, fire, toxic gas, or water through the penetrations.
3. The firestopping material shall maintain/establish the fire-rated integrity of the wall/barrier that has been penetrated.
4. All through penetrations in a fire rated surface require a sleeve, regardless of penetration diameter or penetrating cable count.
5. Using a “ring and string” method of installing cabling for membrane penetrations in a wall cavity is acceptable, provided the solution was accepted by the Owner in writing. Code-compliant firestopping rules still apply.
6. Coordinate firestopping procedures and materials with General Contractor.
7. Sharing the pathway of other trades/utilities through compliant and non-compliant penetrations does not remove the requirement to maintain code-compliant firestopping.
8. Provide and install removable, intumescent mechanical systems in floor chases for all openings greater than 0’-4”.
9. Provide manufacturer recommended material for rated protection for any given barrier.
10. Laminate and permanently affix adjacent to chases the following information:

    a) Manufacturer of firestop systems.
    b) Date of installation/repair.
    c) Part and model numbers of system and all components.
    d) Name and phone numbers of local distributor and manufacturer’s corporate headquarters.

11. Solutions and shop drawings/submittals for firestop materials and systems shall be presented to the General Contractor for written approval of materials/systems prior to purchase and installation.
12. Materials shall be installed per manufacturer instructions, be UL-listed for intended use, and meet NEC and local codes for fire stopping measures.
13. The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and maintain the characteristics for which it is designed to allow for the removal and/or addition of communication cables without the necessity of drilling holes in the material.
14. Develop training manuals with instructions on methods of adding or removing cabling to/from firestopped sleeves and chases.

F. Within the normal environment, the installed systems shall not generate nor be susceptible to any harmful electromagnetic emission, radiation, or induction that degrades, or obstructs any equipment.
G. Expansion Capability: Unless otherwise indicated, provide spare conductor pairs in cables, positions in patch panels, cross connects, and terminal strips, and space in cable pathways and backboard layouts to accommodate 20% future increase in structure cable system capacity.
H. In the event of a breach of the representations and warranties contained herein, the Contractor, at their own expense, shall take all measures necessary to make the cabling system work and comply with the applicable manufacturer written technical recommendations and standards.
I. System Tests

1. Upon completion of the installation of the communications infrastructure systems, including all pathways and grounding, the Contractor shall test the system.

    a) Cables and termination modules shall be affixed, mounted or installed to the designed/specified permanent location prior to testing.
    b) Any removal and reinstallation of any component in a circuit, including faceplates, shall require retesting of that circuit and any other disturbed or affected circuits.
    c) Approved instruments, apparatus, services, and qualified personnel shall be utilized.
    d) The Contractor must verify that the requirements of the specifications are fully met through testing with an approved tester (rated for testing parameters listed elsewhere), and documentation as specified below.
    e) This includes confirmation of requirements by demonstration, testing and inspection. Demonstration shall be provided at final walk-through in soft copy and printed test data.

2. Non-Compliant Cabling

a) Testing that shows some or all pairs of cable do not comply with specifications, without written approval by the Owner, shall be replaced at Contractor's expense (including respective connectors).
b) With the Owner's written approval, the over-length cable(s) shall be excluded from requirements to pass standardized tests and shall be explicitly identified.

1) Testing is still required for non-compliant cabling.
2) The tests shall be for wire-mapping, opens, cable-pair shorts, and shorts-to-ground.
3) The test results must be within acceptable tolerances and shall be submitted with the Owner's acceptance document.

3. Failed Tests

a) If tests fail, Contractor shall correct as required to produce a legitimate passing test.
b) Manipulation of tester parameters on a failing test to achieve a passing test is unacceptable.
c) If the Contractor is found to have manipulated or falsified any failing test result to show a "PASS" for any reason (without written notice and prior approval of the Owner), the Contractor shall be required to employ a Third-Party Testing Agent selected by the Owner to retest the complete cable plant and shall be required to pay all costs associated with this retesting.

4. The owner reserves the right to be present during any or all testing.

3.3 CLEANING

A. The Contractor will clean all surfaces prior to final acceptance by the Owner.

3.4 COMPLETION INSPECTION AND PUNCH LIST

A. When the Contractor determines that the Scope of Work has been completed in accordance with the plans and specifications, the Contractor shall schedule a Completion Inspection with the Owner.
B. A Punch List will be generated during the Completion Inspection containing deficiencies in need of corrective action.
C. Complete all punch list deficiencies within 10 working days. The work is not complete until all punch list deficiencies have been addressed.

3.5 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted, and the Owner is satisfied that all work is in accordance with contract documents, the Owner shall notify Contractor in writing of formal acceptance of the system.
B. The contractor must warrant in writing that 100% of the installation meets the requirements specified herein (Standards Compliance & Test Requirements).
C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation (PDF) and hard copies as described herein.

END OF SECTION

SECTION 270526
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes grounding and bonding products, design requirements and installation for communications systems.
B. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 271500 Communications Horizontal Cabling
4. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications referenced in Section 270000 form a part of this specification. The publications are referred to in the text by basic designation only.
B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.
C. Conflicts

1. Refer to Section 270000.

D. Codes and Standards

1. Refer to Section 270000.

1.3 SYSTEM REQUIREMENTS

A. General

1. All conductor wire, busbars and conduit shall be UL listed.
2. The communications ground system shall be independent from all power grounding except for the connection to the building's electrical service main grounding electrode system.

3. Power grounding and/or bonding shall not be allowed to interfere or provide any back feed or be a conductor to the separate communications ground system source or to any communications bonded materials or equipment.

B. Primary Bonding Busbar (PBB) and Telecommunications Bonding Conductor (TBC)

1. The main ground source feed for the Primary Bonding Busbar (PBB) shall be an independent feed from the building's electrical service main grounding electrode system, known as the Telecommunications Bonding Conductor (TBC).
2. The TBC shall be a stranded copper ground wire from the building ground system to the PBB sized at a minimum #4/0 unless otherwise sized by the Electrical Engineer of Record.
3. The TBC connections shall be low emission exothermic welds at the connecting ends.

C. TEBC and RBC

1. All cabinets and racks shall be connected by the Telecommunications Equipment Bonding Conductor (TEBC). The RBC is a stranded copper #6 conductor connected to the vertical rack bonding terminal. All connections shall be irreversible crimp connections. Route conductor to minimize the quantity of sweeping bends.

1.4 SUBMITTALS

A. Refer to Section 270000.

1.5 QUALITY ASSURANCE

A. Refer to Section 270000.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 270000.
B. The Contractor shall ship on manufacturer's standard reel sizes of one continuous length. Where cut lengths are specified, mark reel quantity accordingly.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include:

B. Cable Manufacturers

1. Houston Wire and Cable Company
2. Okonite Company
3. General Cable
4. Pirelli Cable Corporation
5. Triangle Wire and Cable
6. Approved Alternate

C. Electrical Service Entrance Bonding Conductor and Connector Manufacturers

1. Copperweld
2. Thomas & Betts
3. Blackburn
4. Approved Alternate

D. Exothermic Connector Manufacturers

1. Erico Products (Cadweld)
2. Continental Industries (thermOweld)
3. Harger
4. Approved Alternate

E. Crimp Connector Manufacturers

1. Thomas & Betts
2. FCI Burndy Electrical
3. O-Z/Gedney
4. Approved Alternate

F. Telecommunication Grounding Busbars

1. Chatsworth
2. Panduit
3. Leviton
4. Approved Alternate

G. Bonding Straps

1. Chatsworth
2. Harger
3. Brundy
4. Approved Alternate

H. C-Type Compression Taps

1. Brundy
2. Harger
3. Approved Alternate

I. Antioxidant Joint Compound

1. Chatsworth
2. Similar Products Acceptable

J. Labeling

1. Refer to Section 270000.

K. Firestopping

1. Refer to Section 270000.

2.2 MATERIALS

A. Communications Grounding Conductors: Copper American Wire Gauge (AWG) wire of the following sizes:

1. Telecommunications Bonding Conductor (TBC): #4/0 (unless otherwise sized by the Electrical Engineer of Record)
2. Telecommunication Bonding Backbone (TBB): #3/0 (unless otherwise sized by the Electrical Engineer of Record)
3. Backbone Bonding Conductor (BBC): equal AWG as the TBB (unless otherwise sized by the Electrical Engineer of Record)
4. Telecommunications Equipment Bonding Conductor (TEBC): #4
5. Rack Bonding Conductor (RBC): #6

B. Grounding Connectors

1. Connectors shall be a copper alloy material and two-hole, double-crimp compression lug type at the connecting ends.

C. Primary Bonding Busbar (PBB)

1. Use pre-drilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors.
2. Sized for the immediate requirements and allow for 25% growth.
3. The minimum dimensions shall be 0’-¼” thick X 0’-4” wide X 1’-8” long.
4. Contain (2) tiers of pre-drilled holes for use with standard sizes of two-hole copper compression lugs.
5. ASTM-B187-C11000 Copper bar suitable for use with two-hole compression-type copper lugs.

D. Equipment Cabinet and Rack Bonding Busbar (RBB)

1. Provide and install a vertical ground busbar in all racks and equipment cabinets to be used as an equipment grounding bus with associated mounting hardware.
2. The minimum dimensions shall be 0'-¾" in width by 0'-3/16" in thickness.
3. The busbar shall have pre-drilled holes and shall be suitable for use with two-hole compression-type copper lugs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 270000.

3.2 PREPARATION

A. Refer to Section 270000.
B. Copper and copper alloy connections should be cleaned prior to connection.

3.3 INSTALLATION

A. Refer to Section 270000.
B. The Contractor shall install the work in accordance with the specifications, drawings, manufacturer's instructions and approved submittal data.
C. All work shall be supervised and reviewed by the Contractor's RCDD or Project Manager.
D. Installation plans and Requests For Information (RFIs) shall be reviewed by the Contractor's RCDD or Project Manager.
E. General

1. Bonding and grounding procedures and components shall comply with ANSI/TIA-607-C "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications".
2. Bonding should be accomplished such that the bonding system is integrated and compliant with NEC specifications.
3. Bonding conductors shall be routed with minimum bends or changes in direction and should be made directly to the points being bonded.
4. Bonding connections should be made by using compression copper lugs. However, for parts of the ground electrode system that are subject to corrosion, must carry high currents reliably, or for locations that require

minimum maintenance, connections are made with low emission exothermic welding (see NEC Article 250).

5. Make connections to dry surfaces only.
6. Remove paint, rust, oxides, scales, grease and dirt from surfaces before making connection.
7. Burnish clean a 0'-1" X 0'-1" area, drill, tap, apply an adequate amount of antioxidant joint compound mixed for the metal surface types affected, and bolt conductor and connector to burnished and compounded area. Ensure proper conductivity.
8. Route bonding conductor(s) the shortest distance between bonding contact points.
9. The ground-wire connecting ends shall have a minimum amount of insulation removed at the ground lug.
10. Do not connect ground wire in power cable assemblies to the telecommunications ground system.
11. All grounding and bonding conductors shall be copper and may be insulated. If bare-bonding conductors are used, isolate bonding conductors and prevent contact.
12. Antioxidant material shall be installed to separate dissimilar metals and prevent corrosion.
13. If multiple systems are involved (lightning protection systems, communications, radio and TV, CATV, etc.), those systems shall be bonded together to minimize potential differences between the systems, per NEC 250.94.

F. Telecommunication Bonding Conductors

1. Each telecommunications grounding and bonding conductor shall be labeled at each end detailing the function and room number of its opposite end. Labels shall be located on conductors as close as practicable to their point of termination in a readable position. Labels shall be nonmetallic and include the following text, "TELECOMMUNICATIONS GROUND - DO NOT REMOVE. IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER".
2. Furnish and install all required bonding material, hardware, and utilize tools manufactured for this purpose.
3. The connections of the TBC, TBB, BBC, TEBC, and RBC shall be made using low emission exothermic welding or hydraulically crimped with a double crimp connector. Two-hole grounding lugs are preferred for connection to the grounding bus bars.

    a) Any low emission exothermic welding shall be by Division 26 or as deemed by the General Contractor.
    b) Coordinate with the building services personnel in occupied spaces to prevent the smoke from the exothermic weld process from potentially setting off smoke/fire alarms.

4. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in a ferrous metallic conduit that exceeds 1m (3ft) in length, the conductors shall be bonded to each end of the conduit using a grounding bushing or a No. 6AWG conductor, minimum.
5. The bonding conductors should be installed without splices.

    a) Where splices are necessary, the number of splices should be minimized, be accessible, and be located within the telecommunications spaces.
    b) Joined segments of a bonding conductor shall be connected using exothermic welding, irreversible compression-type connectors, or equivalent. All joints shall be adequately supported and protected from damage.

G. Equipment Cabinets and Racks

1. The busbar shall be installed at the base and back of each cabinet/rack for floor fed cabinets/racks.
2. The busbar shall be installed at the top and back of each cabinet/rack for top fed cabinets/racks.
3. Each cabinet and rack shall be provided with a minimum # 6 AWG ground wire.
4. Do not loop from cabinet/rack to cabinet/rack.
5. Each cabinet or rack bay against the wall shall be bottom/side ground fed from the wall.

    a) Wall ground feeds/raceways to racks shall not be exposed on the walls.
    b) Exception: Some cabinet or rack bays will require the ground to be fed from the ceiling raceway.

6. All ground raceways within each cabinet/rack or cabinet base and adjacent-ganged cabinet base shall be an insulated metallic flex type raceway and shall not interfere with equipment mounting frames or equipment mounting brackets.

H. Cable Runway, Cable Raceway and Support System Grounding

1. The Contractor shall provide communications cable tray and cable runway systems with a communication dedicated ground from the SBB.
2. All cable trays need to be electrically continuous per NEC 250.96.

    a) Metal raceways, wire-mesh cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal non-current-carrying parts that are to serve as an alternate grounding path, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and the capacity to conduct safely any fault current plausibly to be imposed on them.
    b) Any nonconductive paint, enamel, or similar coating shall be removed at the threads, contact points, and contact surfaces.
    c) Grounding or bonding conductors shall be connected by fittings designed for that purpose to ensure adequate bonding.

3. The Contractor shall provide and install a #6 AWG ground wire to bond one end of each cable tray/runway system to the SBB.
4. For electrically non-continuous conduits that contain only grounding conductor, the Contractor shall bond the conduit and conductor together at both ends to ground to the nearest TGB with grounding bushings or ground clamps.

I. Shielded Backbone Cabling

1. The Contractor shall terminate and bond the shield to the nearest SBB or PBB at both ends, following manufacturer's guidelines.

3.4 FIELD QUALITY CONTROL

A. Testing

1. Upon completion of the electrical system, including all grounding, the Electrical Contractor shall test the system for stray currents, ground shorts, etc.
2. Approved instruments, apparatus, services, and qualified personnel shall be utilized.
3. If stray currents, shorts, etc., are detected, eliminate or correct as required.

END OF SECTION 270526

SECTION 271500
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section of the horizontal cabling portion of a structured cabling system includes:

1. UTP Copper cabling
2. Termination and patch cables

B. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in communications rooms.

C. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts

1. Refer to section 270000.

D. Codes and Standards

1. Refer to section 270000.

1.3 SUBMITTALS

A. Refer to sections 270000.

1.4 QUALITY ASSURANCE

A. Refer to section 270000.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to sections 270000 and 271300.
B. Storage temperature range: -40°F to 149°F (-40°C to 65°C)

1.6 PROJECT/SITE CONDITIONS

A. Refer to section 270000.

1.7 WARRANTY

A. Refer to section 270000.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Labeling

1. Refer to section 270000.

B. Firestopping

1. Refer to section 270000.

2.2 ACCEPTABLE COPPER MANUFACTURERS

A. UTP Plenum Rated Cable – Category 6

1. Ber-tek
2. Commscope / Uniprise
3. Superior Essex
4. Belden
5. General Cable
6. Approved alternate

B. Data/Voice Outlet Components

1. Leviton
2. Commscope / Uniprise
3. Ortronics
4. Panduit
5. Approved alternate

C. Patch Panels (24 or 48 port) – Category 6

1. Ortronics
2. Leviton
3. Panduit
4. Commscope / Uniprise
5. Approved alternate

D. Copper Patch Cords – Category 6

1. Ortronics
2. Leviton
3. Panduit
4. Commscope / Uniprise
5. Approved alternate

E. Wall and/or Rack Mount 110 Termination Blocks

1. Panduit
2. Commscope / Uniprise
3. Leviton
4. Ortronics
5. Approved alternate

F. Faceplate for wall-mount telephones

1. Leviton 4108W-1SP
2. Panduit KWP6
3. Approved alternate

2.3 ACCESSORIES

A. Provide one (1) full-size hard copy in color of an as-built floor plan designating workstation locations, pathways, and cabinet locations. Confirm hard copy size with Owner.

2.4 HORIZONTAL COPPER CABLING

A. Recognized cabling for providing the signal medium from the work area to the communications room shall include the following:

1. Category 6 UTP cable

B. Category 6 UTP Cable Requirements

1. 23/24 AWG solid bare copper
2. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP (communications multipurpose plenum)
3. Cable shall terminate on an eight-pin modular jack at each outlet. All horizontal cabling shall meet or exceed the ANSI/TIA-568.2-D Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
4. Cables shall be marked as UL verified with a minimum of Category 6 rating
5. The cable shall support Voice, Analog Base band Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, as well as all 77 channels (550 Mhz) of analog broadband video
6. The maximum horizontal cable length for Category 6 copper cable from the termination of the cable in the communications room to the outlet is 295’-0”.
7. Cable shall meet or exceed the following electrical characteristics:
8. Cable shall be specified to 250 MHz and shall meet the manufacturer’s guaranteed electrical performance and physical specifications.

2.5 TERMINATION HARDWARE

A. Patch panels

1. Patch panels shall be rated to match installed cable plant
2. The wiring block shall accommodate #23 AWG cable conductors.
3. All modular cross-connect panels shall be UL-listed.

B. Work Area Outlet

1. Universal eight-position jack pin/pair assignments
2. Jack Color:

a) Data: White

C. Work Area Outlet Faceplates:

1. White or ivory to match electrical outlets.

2.6 PATCH CABLES

A. Verify exact quantities and lengths with Owner prior to purchase
B. Patch Cable requirements:

1. Category 6, stranded UTP cable
2. Standard modular non-keyed, 8-position 8-conductor plug
3. 94V-0 rated
4. UL listed
5. Meets FCC Part 68

C. Provide either a 3’-0”, 5’-0”, 7’-0”, or 10’-0” Patch Cords at the communications room for each installed cable.

1. Coordinate with Owner on the active equipment layout prior to purchase to ensure correct sizing of patch cords from patch panels to switching equipment.

D. Provide a 10’-0” Station Cord for each work area outlet cable installed.
E. All cords shall conform to the requirements of ANSI/TIA-568.2-D Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL LAN Certification and Follow-up Program.
F. Cords shall be equipped with an eight-pin modular connector on each end, wired straight through and shall be of appropriate length for application.
G. All rated patch cords shall be round, and consist of #23 AWG copper, stranded conductors, tightly twisted into individual pairs.
H. Patch cords shall be made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.

2.7 IDENTIFICATION (LABELING) SYSTEM

A. Refer to sections 270000.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 270000.

3.2 PREPARATION

A. Refer to section 270000.
B. The Contractor shall check pathways, raceways, and other elements for compliance with space allocations, installation tolerances, debris, hazards to cable installation, and other conditions affecting installation prior to installation.

3.3 INSTALLATION REQUIREMENTS

A. Refer to section 270000.
B. All installation shall be done in conformance with ANSI/TIA-568-D standards, BICSI methods, industry standards and manufacturer's installation guidelines.

    1. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities.
    2. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation.
    3. This shall also apply to all damage sustained to the cables by the Contractor during the implementation.

C. Install cable using techniques, practices, and methods that are consistent with specified data cabling and the installed components and that ensure specified performance levels of completed and linked signal paths, end to end.

    1. Pull cables in smooth and regular motions using methods that prevent cable kinking.
    2. Pull cables simultaneously if more than one is being installed in the same raceway/pathway.
    3. Install open cabling parallel and perpendicular to surfaces or structural members following surface contours where possible.
    4. Do not bend cable greater than a bend radius of 0’-1”.

D. Provide a 10’-0” service loop at the communications room and shall provide a 3’-0” service loop above the access ceiling unless specified otherwise.

    1. All service loops shall be a minimum of 1’-6” (18”) in diameter and be accessible for maintenance.

E. Coordinate loop placement and orientation with the technology consultant.

    1. This allows for future changes or expansion without installing new cables.

F. Install cables in continuous “home run” lengths from workstation outlet to specified patch panel.

1. No intermediate punch down blocks or splices may be installed or utilized between the communications rooms and the workstation outlet without written Owner permission.

G. All cables must be handled with care during installation so as not to change performance specifications.

1. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable.
2. There shall never be more than 0'-½" of unsheathed cable at either the wiring closet or the workstation termination locations.

H. All cabling and associated hardware shall be placed so as to make efficient use of available space.

1. All cabling and associated hardware shall be placed so as not to impair the equipment's efficient use of their full capacity.

3.4 CABLING METHODS

A. The Contractor shall provide cabling in accessible spaces, cable tray, (surface and/or enclosed raceway), conduits, and/or J-Hook cable support system.

1. Within consoles, racks, cabinets, desks, and counters, in accessible ceilings spaces and in gypsum board partitions where open cable method may be used.
2. Use UL or ETL listed plenum rated cable in all spaces.
3. Provide all necessary installation materials (lacing bars at patch panels, etc), hardware, tools and equipment to perform insulation displacement type terminations at all data outlets, patch panels, materials.

B. Conceal raceway and cabling except in unfinished spaces as is practical.
C. Exposed Cable

1. All station cabling shall be installed inside walls or ceiling spaces whenever possible.
2. Exposed station cables will only be run where indicated on the drawings and will only be allowed when no other options exist.

a) Owner must approve all exceptions.

D. The Contractor shall utilize conduits and J-hooks.
E. All cabling placed above drop ceilings must be supported by J-hooks, caddy bags or conduit.

1. The Contractor shall permanently affix cable supports to the building structure or substrates and provide attachment hardware and anchors designed for the structure to which attached and are suitably sized to sustain the weight of the cables to be supported.

    a) Attaching cable to pipes or other mechanical items is not permitted.
    b) Cabling shall not be attached to ceiling grid wires.

2. Multiple cables are to be dressed every 5’-0” to 7’-0”.

    a) Maximum cable sag between cable hooks is 3”-6”.

F. The Contractor shall route data and voice cables separately in a neat and orderly fashion.

1. No cable ties or wraps shall be used to secure the cables in the runway outside of the communications rooms. Cable ties shall be rated for the environment.

G. Keep all items protected before and after installation with dust and moisture proof barrier materials/envelopes.

H. If wiring is terminated on patch panels, data, voice jacks prior to painting, carpet installation, and general finish clean up, these jacks shall be placed in a protective envelope to ensure dust, debris, moisture, and other foreign material do not settle onto jacks’ contacts.

1. Envelope will be removed on final trim out after other trades have completed their finish work.
2. It shall be the Contractor’s responsibility to ensure the integrity of these protective measures throughout the life/installation of the project.

    a) Cable bundles shall be routed and dressed in such a manner that prior to termination the cables are not subject to damage and misuse such as installers walking on the bundles that are on the floor.
    b) Cable pulling force shall not exceed 25 lbs of pulling tension or cable manufacturer’s recommended pulling tensions.
    c) Do not leave cables on the floor unprotected or cable bundles hanging from the ceilings. Coil them up in a temporary manner and protect them from damage.

I. Cables shall be combed and dressed in a manner as to prevent twists, “braiding” and crossed cables in the cable bundle from the communication room entrance to the termination point at the rear of the patch panel.

1. Behind the patch panel, the cable bundle shall be attached to the rear cable support bar/lacing bar, and shall drop out each cable in a neat, cascading manner to prevent crossed and/or interwoven cables to each patch panel port termination point.

a) Use Velcro wraps instead of cables ties for all bundling in the communications rooms.
b) Plastic/nylon tie-wraps are not allowed to permanently secure cables inside the communications room.

3.5 CABLING SEPARATION

A. Comply with TIA rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.
B. Maintain a minimum spacing of 1’-6” (18”) from electrical feeders and/or branch circuit wiring including, but not limited to, light fixtures, sources of heat and EMI sources.
C. Maintain a minimum spacing of 1’-0” from auxiliary systems cabling.
D. Maintain a 1’-0” separation where cables must pass perpendicularly to electrical, plumbing, or other wiring, conduit, or piping systems.

1. Use non-conduit bushings, if necessary to maintain separation, which allow for the addition of a reasonable number of cables in the future.

E. Maintain communications pathways away from electrical apparatus such as motor driven equipment and transformers, minimum separation distance of 10’-0” is recommended.

3.6 CABLING TERMINATION

A. Terminate cables in consistent consecutive order.
B. Terminate cables onto 8P8C modular patch panels without damaging twisted pairs or jacket.
C. Arrange cables on patch panels in ascending order of room numbers and outlet numbers within rooms.
D. Provide a 10’-0” service loop for horizontal cables at each rack in communications rooms.

1. Locate loop at ceiling deck or on bottom of cable runway in minimum 1’-6” (18”) diameter.

E. Provide a 3’-6” service loop for horizontal cables at work area outlets. Locate service loop above or below data/voice outlet were vertical cable run transitions to horizontal run.

F. Maintain twists in cable pairs to within 0'-½" of termination.
G. Video Surveillance Systems Cabling (Electronic Safety and Security <ESS> devices)

1. Video Cameras will require a field terminated plug on the end of a horizontal cable to be directly plugged into device.

a) Follow TIA-862-B Building Automation Standard.
b) Contractor shall use applicable equipment in testing solid conductor plug.

2. Group all security systems cables in one group.
3. Clearly label cable number and function, in the last positions on the horizontal cabling blocks in each communications room.

H. Start numbering at the left of the main door to the room and continue in a clockwise direction around the room.

1. The cables within the room will be terminated starting with the cables located to the left of the main door to the room and continue around the room in a clockwise direction.

3.7 TERMINATION HARDWARE

A. Station Hardware

1. Flush mount jacks shall be mounted in a faceplate with back box.
2. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches without prior Owner approval.
3. 8P8C Jack Pin Assignments for work area outlets shall match the T-568B wiring scheme.

B. Patch panels

1. Copper cables shall be terminated in eight position/eight conductor (8P8C) modular patch panels.
2. All Modular jack panels shall match the T-568B wiring scheme.

C. Work Area Outlet

1. 8P8C non-keyed modular outlets for applications up to one Gbps and ANSI/TIA-568-D compliant for the specified transmission requirements.

D. Work Area Outlet Faceplates:

1. Furnish and install blank plates in all unused ports.

3.8 SPECIAL CIRCUITS

A. The Contractor shall coordinate with the Owner on the cable termination plan for special circuits, including cables to wireless access point locations, security, elevators, fire alarms, etc.
B. Wireless Access Points

1. Install two (2) cable(s) from dedicated wireless patch panel(s) in communications room to outlets having 8P8C connectors within a secure metal enclosure.

3.9 IDENTIFICATION AND LABELING

A. The labeling system shall consist of a hand-held portable printer and labels appropriate to the application. Handwritten labels are not acceptable.
B. Fiber termination hardware (designation strip) shall have a 0’-¾” x 0’-¼” thermal transfer printable label with a permanent acrylic adhesive.
C. All labels shall be permanent and shall not fade, peel, or deteriorate due to environment or time.
D. The Contractor shall provide a copy of the finalized plan in writing to the Owner representative and DataCom Design Group for review and authorization to proceed.

1. Coordinate with Owner for specifications on labeling of all hardware, cabling, and related equipment prior to any testing.

E. Labeling requirements:

1. Label cable terminations on designation strips.
2. Label all cable at each terminating point.
3. Label each port of the work area outlet.
4. Cable identification numbers shall not be duplicated.
5. Label patch panels in the cabinet to match those on the corresponding voice and data outlets.

a) The font shall be at least 0’-1/8” in height.

6. Where a wireless access point is installed above an acoustical ceiling, label the ceiling grid frame below the access point, displaying the data port number and, if applicable, the access point identification number. Coordinate labeling of grid with Owner and Architect prior to application of labels.

7. Label each distribution rack, block and other terminating equipment unit and field within that unit within 0’-4” from the block or patch panel termination. Keep labels in a neat and orderly lineup.
8. Label each connector and each discrete unit of cable-terminating and connecting hardware within connector fields, in wiring closets and equipment rooms.

    a) Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.

9. Post the cable schedule in a prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations.

F. Location and termination field description

1. Room location
2. Rack-mount or Wall mount
3. Termination field type

    a) Specific patch panel ports versus a separate dedicated patch panel

G. Unique identifiers

1. Segregation and position on equipment rack
2. Port color-coding
3. Unique labeling

H. Documentation

1. Provide electronic copy of final comprehensive schedules for project in software and format selected by Owner.

    a) All labels shall correspond to as-built drawings and to final test reports.

2. All cable inventory data documentation shall be submitted in format coordinated with and approved by Owner so that data can be incorporated into existing databases.
3. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
4. Complete cross connect documentation is required.

3.10 FIELD QUALITY CONTROL

A. Refer to section 270000.

3.11 POST-INSTALLATION TESTING

A. Contractor shall test each pair or strand of every cable prior to acceptance. (100% PASS)
B. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.
C. Standards Compliance and Test Requirements:

1. Cabling shall meet ANSI/TIA-568.2-D Category 6 Horizontal cabling requirements.

D. Attenuation, NEXT, PSNEXT, Return Loss, ELFEXT, and PSELFEXT data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin.

1. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements.
2. Information shall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards.
3. Length, propagation delay, and delay skew relative to the relevant limit.

a) Length, propagation delay, and delay skew shall be tested relative to the relevant limit.
b) Test shall also include mutual capacitance and characteristic impedance.

1) Any individual test that fails the relevant performance specification shall be marked as a ‘FAIL”.

E. Cable Test Documentation:

1. Cable test documentation shall be submitted in hard copy and electronic formats.

a) If proprietary software is used, disk or CD shall contain any necessary software application required to view test results.
b) Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report.
c) Certificate shall reference traceable circuit numbers that match the electronic record.

2. Each test record shall contain the cable ID as follows:

a) "MEDIA TYPE – SOURCE ROOM – DESTINATION ROOM – STRAND/PAIR #", e.g. MM-MC-HC23-001.

3. Test results saved within the field-test instrument shall be transferred into an accessible database utility that allows for the maintenance, inspection and archiving of the test records.

   a) These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument".
   b) The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

4. Test reports shall include the following information for each cabling element:

   a) Wire map results indicate that 100% of the cabling has been tested for shorts, opens, miss-wires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
   b) Length, propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
   c) Cable manufacturer, cable model number/type, and NVP
   d) Tester make & model, serial number, hardware version, and software version.
   e) Cable ID and project name
   f) Auto-test specification used
   g) Overall pass/fail indication
   h) Date of test

5. Acceptable testers:

   a) Fluke DSX Cable Analyzer
   b) Approved equivalent

3.12 CLEANING

A. Refer to section 270000.

3.13 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
B. Contractor's RCDD or Project Manager shall warrant in writing that 100% of the installation meets the requirements specified herein.

C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and submittal and approval of full documentation as described above. Tests with the "* PASS" (asterisk) will not be acceptable.

1. These circuits must be repaired to meet "PASS".

END OF SECTION 271500

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SECTION 280000
ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 PROJECT SUMMARY/OVERVIEW

A. This document covers the general requirements for work to be performed to provide electronic security and surveillance.

B. The contents of this document, along with related drawings and other documentary material, are critical to the security of this project and Owner and shall remain secure and confidential.

1. Confidential information shall not be deliberately or inadvertently disclosed to anyone other than the Contractor's personnel and subcontractors who require disclosure to perform their portion of the work.
2. This confidential information shall be tracked to ensure that copies are accounted for and properly destroyed when no longer needed to perform the work.

C. The security systems shall consist of the following integrated subsystems as specified herein:

1. Electronic Access Control and Intrusion Detection
2. Video Surveillance
3. Emergency Intercommunications and Duress
4. Wire and Cable

D. One electronic security systems integrator (security subcontractor) will provide the work specified in sections 280000, 281000, 282300 and 282600. This work in these sections requires subsystem integration, will not be subcontracted, and will be provided by one contractor.

E. Provide complete turnkey systems with the exception of those items noted within this specification as being provided by others.

F. Related Sections include:

1. Section 087100 Door Hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 281000 Electronic Access Control and Intrusion Detection
5. Section 282300 Video Surveillance
6. Section 282600 Intercommunications
7. Section 283100 Fire Alarm and Smoke Detection

1.2 GENERAL REQUIREMENTS

A. Upon completion of commissioning testing and Owner acceptance, DataCom Design Group bears no liability or responsibility for the continued proper operation of the installed systems.
B. The Items described herein shall not be modified or substituted without consent of DataCom Design Group and/or the Owner.
C. Security subcontractor's manager/supervisor shall attend meetings arranged by the Contractor, Architect, Owner or other parties affected by the work of this Section 280000.
D. If the manufacturer of security devices or connecting hardware has supplied post manufacture performance data, copies of such are to be kept for inclusion in the documentation and made available to the Owner upon request.
E. All materials are to be new unused and of the latest series of model number, unless otherwise indicated by the Owner or security system designer.
F. All materials shall be rated for the environment they are installed.

    1. All materials shall be UL- and/or ETL-approved and labeled in accordance with NEC for all products where labeling service normally applies.
    2. Materials and equipment requiring UL 94, 149 or 1863 listing shall be so labeled.
    3. Modification of products that nullifies UL labels is not permitted.

G. All security integrator personnel must be manufacturer certified and capable of an installation that falls under the manufacturer's guidelines necessary to obtain a manufacturer warranty.

    1. The integrator shall provide all components/materials essential for a complete and functional security access and surveillance system.

H. Security integrator shall issue a two (2) year warranty on installation and workmanship.
I. These Specifications and Drawings are intended for bidding purposes only, No part shall be copied or used for any purpose other than bidding on this project.

    1. This package shall be contractual upon bid award.

J. Drawings and Specifications are to be used in conjunction with one another and to supplement one another.

    1. In general Specifications determine the nature and quality of the materials and tests, and drawings establish the quantities, details and give characteristics of performance that should be adhered to in the installation of the security system components.
    2. If there is an apparent conflict between the drawings and specifications, or within the specifications themselves, the items with greater quantity or quality shall be estimated and installed.
    3. Clarification with the Owner/Designer about these items shall be made prior to purchase and installation.
    4. Questions regarding the Specification or system requirements should be directed in writing to DataCom Design Group or the Owner.

K. Security integrator shall adhere to Division 1 general requirements and written security Specifications and Drawings within this construction package and shall be responsible for complying with all local, state and federal laws or regulations applicable to the work being performed, even though said law, rule or regulation is not identified herein.
L. Security integrator shall arrange and pay for any inspections required by the public agencies having jurisdiction in the area.
M. The security contractor shall procure and maintain for the duration of this agreement, insurance against claims for injuries to persons or damages to property which may arise from, or conjunction with, the performance of the work hereunder by the security integrator, his agents, representatives, or employees.

    1. The security integrator shall pay the cost of such insurance.

N. The security integrator will respect and protect the privacy and confidentiality of the Owner, his employees, processes, products, and intellectual property to the extent necessary, consistent with the legal responsibilities of the State of Texas and the Owner.
O. If required the security integrator shall sign a non-disclosure agreement and abide by its requirements to keep confidential all information concerning bid documents and this Project.
P. Furnish submittals and manuals in accordance with Division 1.
Q. Furnish a detailed material list complete with suppliers (distributors) list of components and distributors name, address, and phone number.
R. Refer to Specifications issued by Architect, Division 1, for Project and cost payments.

1.3 REFERENCES

A. The publications listed below form a part of this Specification. The publications are referred to in the text by basic designation only.
B. Specific reference in Specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.
C. For conflicts between referenced requirements and contract documents comply with the one that is more stringent.

    1. Federal, State, and Local codes, regulations and ordinances
    2. NFPA 101: Life Safety Code
    3. NFPA 72: National Fire Alarm Code
    4. NFPA 730: Guide for Premises Security
    5. NFPA 731: Standard for the Installation of Electronic Premises Security
    6. National Electric Code (NEC), latest edition
    7. Building Codes (UBC) (IBC), latest editions
    8. Occupational Health and Safety Act (OSHA)
    9. Americans with Disabilities Act (ADA)
    10. Local Governing Authorities Having Jurisdiction
    11. Underwriters Laboratory (UL) Applicable Standards for Safety and Security
    12. Institute of Electrical and Electronics Engineers (IEEE) Applicable Standards

13. Telecommunications Industry Association (TIA) Applicable Standards
14. Jefferson County for Security Systems

D. Related Documents

1. Security Drawings
2. General provisions of contract
3. Uniform general conditions
4. Supplementary general conditions
5. Architectural plans & specifications
6. Requirements of Division 1
7. Electrical / Mechanical / Telecommunications specifications and plans.

1.4 DESCRIPTION OF SYSTEM WORK

A. Furnish and install all materials, tools, equipment, and services for all electronic security/surveillance devices to provide functioning systems in accordance with performance requirements specified and any modifications resulting from reviewed shop and field coordinated drawings.

1. Access Control System

a) This system replaces the typical mechanical key controlled door lock with a door locking system that uses an access card as the access credential.
b) The system includes an electric door-locking mechanisms, card reader located adjacent the door, door status sensor, door prop alarm and a request to exit device.
c) Typical system configuration is card or schedule controlled entry with free exiting.

2. Video Surveillance System

a) This system is used to provide video surveillance through the use of cameras of security sensitive areas and target items.
b) The system shall allow for the viewing and recording of images.

B. Provide all supplementary or miscellaneous items and devices incidental to or necessary for a sound and complete installation.

C. Drawings are representative and show general arrangement of systems and equipment, except when dimensioned or detailed.

1. For exact locations refer to dimensioned architectural drawings.

a) Field measurements take precedence over dimensioned drawings.
b) Field verify locations and arrangement of all systems and equipment.
c) Coordinate all work with other trades and Contractor.

D. Circuit Supervision

1. Supervise all signal and data transmission lines, links with other systems, and sensors.

    a) Indicate circuit and detection device faults with both protected zone and trouble signals.
    b) Initiate an alarm in response to opening, closing, or shorting of a signal or data transmission line.

E. RACKS AND ENCLOSURES

1. Wall mounted enclosures, data gathering panels, and power supply panels shall be installed as per manufacturer's requirements.

    a) Coordinate pathways and power with Electrical and Telecommunications Contractors
    b) Furnish all labor, materials, tools, equipment, and services for all control consoles, equipment racks, cabinets, and enclosures not provided by others in accordance with contract documents.
    c) Completely coordinate with work of other trades to avoid duplication in purchasing.
    d) Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.

2. The installation of the relay racks/cabinets for Electronic Surveillance shall be by the Telecommunications Contractor.

    a) Coordinate locations with G.C.

3. The designated security space will provide an area reserved for rack and wall mounted security equipment.

    a) The rack area allows for vertical relay rack(s).
    b) Backboard wall area of 8'-0" X 8'-0" shall be reserved for wall-mounted components.
    c) Cable tray/ ladder shall be by the telecommunications contractor and is provided to facilitate cable access into both wall and rack mounted equipment.

F. Electronics systems work as specified in this Section and Sections 281000, 282300, 282600 shall include:

1. Preparation of pre-installation submittals, including point-to-point wiring information for security equipment to interface to work by others prior to start of any installation work. Include lock permit requests in submittals for review.
2. Furnishing and installation of all security devices, components and accessories.
3. The furnishing and coordination on installation of special back boxes for security equipment and field devices as required.
4. Furnishing, installation and termination of all copper wiring and cabling including any special purpose wire and cable for electronic security systems.

a) Coordinate all network and fiber optic cable interface provided by telecommunications subcontractor.

5. Coordinate raceway and power distribution systems provided by Division 26.
6. Provide and install 12/24 VAC/DC input power to all field devices as required.
7. Coordination with other trades and Owner required to facilitate the installation of the security equipment including:

   a) Division 08 (doors)
   b) Division 26 (power, raceways, and fire alarms)
   c) Division 27 (telecommunications network interface).

8. Wiring and termination of electrified door hardware by security subcontractor shall be concurrent with the installation of these electrified components by the door hardware subcontractor.
9. Programming of all security control equipment and prior coordination with the Owner's security and telecommunications personnel.
10. Preparation of "As-Built" documentation.
11. Warranty service for completed work.

1.5 SUBMITTALS

A. Refer to Requirements of Division 1.
B. Pre-Installation Submittal Requirements

1. Submittals for electronic security shall be complete and submitted at the same time.

   a) No partial submittals will be accepted for review.
   b) Allow 2 weeks for consultant review of submittals.

2. General Requirements

   a) A functional description of each system.
   b) All cable and wiring types for each device type used.
   c) Written confirmation that lock wiring and access control systems requirements have been coordinated with electrified door hardware, fire alarm systems, automatic door controls, and overhead door controls specified in other sections and other packages.
   d) Power supply points listing with devices and maximum loads to prevent overloading.
   e) Battery backup calculations to show load and back-up times for UPS and power supplies with batteries.
   f) Equipment schedules listing all system components, manufacturer, model number and quantities of each.
   g) Qualifications and proof of work history (with references).

3. Product Data Cut-sheets

   a) Complete manufacturer's technical data including manufacturer warranty information, descriptive literature, illustrations, and

installation instructions for all components included within this project indicating compliance with applicable referenced standards, size, dimensions, model number, electrical characteristics, support requirements, connection requirements and all applicable information verifying that submitted components comply with Contract Documents.

4. Shop Drawings

a) Floor plans necessary to identify specific device locations, cable routes and quantities, cable types, riser locations, and references to installation details and diagrams.
b) Riser diagram showing routes between floors or other areas that are not easily identified on the floor plans.
c) Security One-line diagrams showing all input and output points of the system.

1) The Contractor shall make any corrections required by the consultant team, file with him two corrected copies and furnish such other copies as may be needed.
2) The consultant’s approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless he has in writing called the Architect's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.

d) Shop Drawings are defined as drawings, diagrams, schedules and other data specially prepared by a distributor, supplier, manufacturer, subcontractor or contractor to show some part of the work.

1) Shop Drawings represent what the contractor intends to construct with the review/approval process formalizing the method for a Contractor/Integrator to demonstrate how they will accomplish these obligations allowing the design team a review of compliance compared to the IFC documents.
2) Thus, submitting copies or reproductions of the IFC documents produced by DataCom Design Group does not represent the unique development of Shop Drawings by the Contractor and summarily will be rejected.

e) Release of CAD Files

1) Contractor may request to utilize DataCom’s AutoCAD floor plan files for assistance in producing shop drawings.
2) Request shall be made by signing DataCom’s "Agreement for Release of CAD Files" letter.

5. Warranty

a) The Contractor shall provide the appropriate documentation to comply with the requirements described in the WARRANTY section.

6. Qualifications

a) The Contractor shall provide the appropriate documentation to comply with the requirements described in the QUALITY ASSURANCE section.

C. Product Substitution

1. All product substitution requests require written Owner acceptance.

a) Document substitution requests with complete data substantiating compliance of proposed substitution with Contract Documents
b) An alternate product must be equal to or exceed specified requirements.
c) Include in each request for substitution:

1) Product identification, manufacturer's name and address.
2) Product Data:

2. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
3. No substitute shall be ordered, installed or utilized without prior written verification of acceptance from the Owner.

D. As-Built drawings shall be in current AutoCAD format, same version as used by the Architect.

1. Dimensions and scale of the drawing sheets submitted shall match the size of the drawing used for the contract documents, and shall include the following.

a) Utilize normally recognized drafting procedures that match AutoCAD standards, Architect, and Designer guidelines and methodology.
b) The As-Built drawings shall incorporate all changes made to the building identified in, but not limited to, Addenda, contemplated change notices, Site Instructions or deviations resulting from site conditions.
c) Dimensioned plan and elevation views of all security components.
d) Cable routing paths of security cables to identified infrastructure pathways.
e) All rack, cabinet, and enclosure locations and labeling thereof.
f) One-line diagrams of equipment/device interconnecting cabling of the security systems.
g) Standard or typical installation details of installations unique to Owner's requirements.
h) Submit one soft and one hard copy with project deliverables within 30 days of project completion.

E. Security integrator shall provide three (3) paper copies and one (1) electronic copy (PDF format) of a properly indexed O&M Manual at the conclusion of the project, which will include, but not be limited to the following requirements:

1. Ring binder with project title, properly indexed, and contractor's name on cover and spine including:

    a) Sequence of operations, design philosophy, and specific functions
    b) System block diagram
    c) Equipment list including:

        1) A brief description
        2) Model
        3) Total number of each item used in the project.

    d) Camera schedule including:

        1) Number
        2) Location
        3) Camera model/manufacturer
        4) View
        5) Lens
        6) Power source
        7) Multiplexer/input
        8) Settings entered on site

    e) Manufacturers' data sheet and O&M manual for associated equipment.
    f) Maintenance requirements for equipment, inspections and preventative maintenance schedules.
    g) As-built drawings for each floor plan layout and rack and wall elevation layouts. Each drawing shall show:

        1) Cable type and identifier
        2) Actual cable routing pathway
        3) Device number (camera, etc.),
        4) Device input/output number.

    h) Final test data (measured video levels, day & night camera snapshots in JPEG format and other significant operating parameters).
    i) List of system associated mechanical locking keys with key codes and tamper resistant hardware types.

F. Additional Closeout Documentation:

1. The Security Contractor shall provide written confirmation that all camera manufacturer default admin passwords have been removed.
2. The Security Contractor shall provide written documentation that all camera audio capabilities have been disabled.

1.6 QUALITY ASSURANCE

A. Electronic security systems integrator (security subcontractor) shall meet the following minimum requirements.

1. Maintain a valid Type B license from the Texas Private Security Bureau.
2. Maintain a valid UL 2050 certification for electronic security systems.
3. Have successfully completed three (3) projects of similar size and complexity that have been in proper operation for a period of one (1) year.
4. Technicians shall be factory trained and certified in specified systems.
5. The Project manager and supervising/lead technician shall have been regularly engaged in the installation and testing of the products specified for not less than five (5) years and maintain manufacturer certification.
6. The security integrator must maintain an operating facility in the local area (50 mile radius) of the Project location to provide service to the Owner for the warranty period.

    a) At the Owners request for service, the security integrator shall dispatch a service technician to the location to affect the required repairs or adjustments.

7. The contractor shall maintain a spare parts inventory necessary to resolve component failures of the system.

    a) Refer to individual specification section for a list of specifically required parts provided to the owner and stored on site. These parts will become the property of the owner.

    1) At the end of the warranty period the security integrator shall test the owner's spare parts and repair or replace as needed to bring the parts up to proper operation.

8. A BICSI RCDD shall approve all on-site work as a recognized member of the Contractor's installation team.

    a) All installation team members must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC methods, standards and codes.

B. Security integrators desiring approval must comply with Division 1 requirements.
C. Security integrator must be cognizant of site conditions, verify locations of new and existing equipment, and determine exact requirements for connection and interface.

1.7 PRE-INSTALLATION MEETINGS

A. Attend and/or arrange a scheduled pre-installation conference prior to beginning any work of this section.

1. Agenda

    a) This venue is to ask and clarify questions in writing related to work to be performed, scheduling, and coordination with the Project manager/Owner representative and consultant.

2. Attendance

a) The security project manager/supervisor shall attend meetings arranged by General Contractor, Owner's representatives, and other parties affected by work of this document.
b) All individuals who will be installers of the electronic security system and equipment in an on-site supervisory capacity, including project managers and lead installers, shall be required to attend the pre-installation conference.
c) Individuals who do not attend the conference will not be permitted to install, or supervise the installation of, any component of the security system.

1) This includes supervisors, project managers, and lead installers of this project.

1.8 POST INSTALLATION MEETINGS

A. At the time of substantial completion the contractor shall call and arrange for a post installation meeting to present and review all submittal documents to include but not be limited to As-Built Drawings, Warranty paperwork, etc.

1. Attendees to be invited shall include:

a) Project manager/Owner representative
b) DataCom Design Group
c) General Contractor
d) Other trades that the GC deems appropriate.

2. At this meeting the contractor shall present and explain all documentation, asking for feedback on its completeness.
3. Any discrepancies or deviations noted by and agreed to by participants shall be remedied by the contractor and resubmitted within one week of the meeting.

1.9 DELIVERY, STORAGE AND HANDLING

A. Equipment and components shall be delivered properly protected and undamaged with original containers, packaging, and labels intact.
B. Store, handle, and protect all related materials and equipment in accordance with Manufacturer's recommendations.
C. Provide additional protection during handling as necessary to prevent breaking, scraping, marring, or otherwise damaging products or surrounding areas.
D. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.

1. Equipment damaged prior to system acceptance shall be replaced at no cost to the owner.

E. Protect all equipment and components that are to be installed from theft, vandalism, or use by unauthorized persons.

1.10 PROJECT/SITE CONDITIONS

A. Security integrator is responsible for conducting a site survey prior to the commencement of work to determine locations of all existing security devices and verify the proposed locations of the new components to be installed.
B. Security integrator will coordinate all work through the Contractor and schedule work to cause as little interference or interruption of existing services as possible.
C. Security integrator will arrange and pay for all necessary permits, licenses, and inspections.

    1. Security integrator shall prepare all information necessary to obtain a permit for Electronic Locking Mechanisms in compliance with the Owner requirements.

D. Verify with Division 26 installer all conduits and special back box requirements in a timely manner.

1.11 WARRANTY

A. See requirements in Division 1 Specifications.
B. The Security Integrator shall warrant all completed work, including all materials and labor, to be free from defects in design, workmanship, and/or materials for a period of two (2) years from final acceptance date.

    1. System acceptance is defined as the completion of all functional performance testing and the resolution of all punch list items.

C. Warranty Service

    1. In the event that defects in the materials and/or workmanship are identified during the warranty period, the contractor shall provide all labor and materials to correct the deficiency.
    2. All service work shall be performed by factory certified technicians.
    3. All warranty service shall include the replacement of all parts and or components as required to restore normal system operation.

        a) If parts or components need to be repaired, a loaner will be supplied and installed until the part or component can be repaired and reinstalled.

    4. Immediately following a warranty service request, the Contractor shall provide written documentation to Owner which details the service work completed, cause of trouble, and any outstanding work required to restore a complete and normal system.

D. Warranty service requests shall be responded to within 4 hours of notification with a qualified service technician on site.
E. All repairs shall be completed within 48 hours upon site arrival.

1. If the failure exceeds 48 hours, the Owner reserves the right to require the contractor provide on-site manufacturer support at no additional cost to Owner.

F. Extended warranties on equipment components offered by the manufacturer shall be passed through to the Owner.

1. Warranty provisions shall be fully transferable only at the direction of the Owner, in the event that ownership of the installed security systems is transferred.

1.12 SYSTEMS STARTUP AND TRAINING

A. After all systems have been tested, accepted and turned on for operation, the Security integrator shall provide "User Training" to Owner personnel.

1. The onsite training shall cover all newly installed electronic security components, devices and systems. The training classes shall total a minimum of twenty (20) hours for up to eight (8) people of the Owner's choosing.
2. Two (2) separate training sessions will be conducted, one for system operators and one for system administrators.
3. The contents of the manuals will include:

a) Title page with subject, system name, owner's name, and an owner approved confidentiality notice.
b) Table of contents.
c) Manual that details system and sub-system operation.
d) Manuals that details system administration procedures and tasks.
e) Manuals that fully detail all programming commands.

4. Provide ten (10) Bound hardcopy System Operation training manuals and one electronic copy (PDF format).
5. Provide two (2) Bound hardcopy System Administration training manuals and one electronic copy (PDF format).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer's are shown in individual specification sections.
B. Equipment manufacturers and model numbers indicated in individual specification sections are identified as minimum equipment requirements.
C. All substitutions shall meet or exceed these minimum requirements and must be approved by the Owner/Architect prior to purchase.
D. All manufacturers' equipment shall be available through a nationally recognized supplier network.

2.2 EQUIPMENT

A. Provide security fasteners on all equipment, device plates, etc. within public areas.

1. Allen head with center pin, hardened steel.
2. Provide four (4) fastener tools to Owner.

B. Equipment installed in exterior applications shall be fitted with fasteners and exposed surfaces of stainless steel or other corrosion resistant material.
C. All materials and equipment used must be new and unused, prime quality products.
D. All equipment or components installed on the exterior of a building where the equipment is subject to adverse weather/elements shall be enclosed in weatherproof enclosures.

2.3 WIRE AND CABLE

A. All wire and cable shall be U.L. approved for its intended application and shall meet or exceed manufacturer's recommendations for the components connected.
B. All conductors and cable shall meet individual security system manufacturer specifications.

1. Provide shielded conductors and cable as required by the manufacturer or as required to provide for interference-free signals.
2. Color coding shall be accomplished by using solidly colored insulation.

a) Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by NEC.

C. Increase conductor sizes on cables as required to be consistent with circuit current ratings, length of wire runs, and manufacturers' recommendations.

1. Alarm device field wiring shall be in accordance with the equipment manufacturer's specifications.
2. Low voltage power circuits shall use conductors as required by the equipment manufacturer's specifications.
3. Plenum rated cable shall be used as required by code.

D. UTP Structured Cabling Systems for IP cameras and intercoms (including pulling, terminating, and testing) by Division 27 Telecommunications contractor.

1. Intra-building data communications circuits shall utilize UTP cable as specified in Telecommunications specifications.

E. Fiber Optic Structured Cabling Systems for IP cameras and intercoms (including pulling, terminating, and testing) by Division 27 Telecommunications contractor.

1. Inter-building and building exterior data communications circuits shall utilize fiber optic cable as specified in Telecommunications specifications.

F. Patch Cables

1. Provide pre-manufactured patch cables (cable, connectors, boots, etc.) as required to connect security systems to voice and data communication outlets.
2. Patch cables shall be certified for their specific use to meet or exceed applicable industry specifications.
3. Provide cable lengths as necessary to neatly route cables through cable management systems and other cable organization systems.
4. Provide connectors as required for proper termination.

    a) Provide boots for connectors where applicable to prevent snagging.

G. The minimum conductor sizes are for distances as per the manufacturer's specifications from security device to security panel.

1. The contractor shall size the conductor accordingly for longer runs.
2. Minimum Conductor and Cable Types and Sizes.

    a) Alarm device field wiring shall be 18/20 AWG stranded copper conductors.
    b) Low voltage power circuits will use 18 AWG stranded copper conductors.

        1) Increase conductor gauge consistent with circuit current requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All personnel working on this project shall be experienced, highly skilled installers with a minimum of three (3) years work on similar type projects.
B. Changes in location of any work require the written approval of the Architect/Owner prior to initiation.
C. Changes in indicated sizes shall not be made without the written approval of the Owner/Architect.
D. Install all equipment in accordance with manufacturer's recommendations.
E. All systems shall be designed and installed to provide 24 hour a day, 7 days a week operation.
F. Primary pathways

1. All security cabling run from rack/enclosure head-end equipment to security devices shall follow primary telecom routing pathways.
2. Security wire non-UTP cabling shall be kept separated from the data cabling
3. Security wire non-UTP cabling shall be routed in bridle rings secured to the outside of the telecom tray where applicable.

    a) Arlington loops or J hooks shall be used where telecom pathways are not present

4. Provide all necessary anchoring devices and supports.

a) Use structural supports suitable for equipment, or as indicated.
b) Check loading and dimensions of equipment with shop drawings.
c) Do not cut or weld to, building structural members.

G. Secondary pathways

1. Arlington loops or J hooks shall be used for secondary pathways
2. Security wire non-UTP cabling shall be kept separated from the data cabling
3. Provide all necessary anchoring devices and supports.

a) Use structural supports suitable for equipment, or as indicated.
b) Check loading and dimensions of equipment with shop drawings.
c) Do not cut or weld to, building structural members.

H. Coordinate extension and connection to commercial, emergency/UPS power circuits provided by Division 26.

1. Make power connections in accordance with Division 26.

I. Shielded and/or screened cables shall be grounded per the hardware manufacturer's instruction.

1. Single point shield grounds shall be grounded at the field panel feeding the device or sub panel and insulated from ground at the termination end of the cable.

J. All installation of security systems shall be complete at least thirty calendar days prior to occupancy.

3.2 RACK AND CABINET INSTALLATION

A. Rack/cabinet installation by Telecommunications contractor.
B. After racks are installed, install all required components to support rack mounted security equipment.

1. Extend UPS/emergency power to rack mounted equipment as required.

C. Install all conduits, back boxes, wire and cable management as required for interconnection of security equipment, data gathering panels, power supply enclosures, and distribution panels in the Security room.
D. Extend commercial/emergency/UPS power circuits as required to security components as required.
E. Neatly lace and dress all cables in each rack.

1. All wiring and cable shall be properly supported.
2. Utilize suitable cable management devices, no tie-wraps for UTP structured cabling allowed.

3.3 GROUNDING AND BONDING

A. Equipment Cabinets and Racks

1. To provide electrical continuity between rack elements, paint-piercing grounding washers shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
2. A horizontal busbar shall be installed at the top and back of each rack for floor fed cabinets/racks.
3. A vertical busbar shall be installed to the rear of the right-hand side rail with thread-forming screws to ensure metal-to-metal contact.
4. Each rack shall be provided with a minimum # 6 AWG insulated ground wire.
5. Do not bond racks serially (loop from rack to rack).
6. Each rack bay against a wall shall be bottom/side ground feeds from the wall.

    a) Wall ground feeds/raceways to racks shall not be exposed on the walls.
    b) Exception

    1) Some rack bays will require the ground to be fed from the ceiling raceway. Refer to drawings for details.

7. The Contractor shall provide a ground strap for each equipment rack and bond to the nearest Telecommunications Bonding Backbone (TBB) connection, Furnish all required bonding materials and hardware manufactured for this purpose.

    a) Follow NEC bonding procedures/specifications.

8. All ground raceways within each rack shall be an insulated metallic flex type raceway and shall not interfere with equipment mounting frames or equipment mounting brackets.
9. Each ground feed shall provide proper installation allowances and penetration depths to provide conversion fittings from solid metallic to insulated metallic flex conduit raceways.
10. To bond each rack to ground, burnish clean a one square inch area, drill, tap, apply an adequate amount of antioxidant joint compound mixed for the metal surface types affected, and bolt connectorized conductor to burnished and compounded area.

    a) Ensure proper conductivity.

B. Cable Runway, Cable Raceway and Support System Grounding

1. The Contractor shall provide communications cable tray and cable runway systems with a communications isolated ground from the TBB.
2. All cable tray needs to be electrically continuous per NEC 250.96.

    a) Metal raceways, wire-mesh cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal non-current-carrying parts that are to serve as an alternate grounding path, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and

the capacity to conduct safely any fault current likely to be imposed on them.

b) Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces, and be connected by means of fittings designed so as to make good bonding points.

3. The Contractor shall provide and install #6 AWG insulated ground wire to bond one end of each cable tray/runway system to the #2/0 TBB.
4. For electrically non-continuous conduits that contain only grounding conductor, the Contractor shall bond the conduit and conductor together at both ends to ground to nearest TGB with grounding bushings or ground clamps.

3.4 LABELING

A. Provide labeling for all security equipment components using waterproof, self-adhesive computer printed labels.

1. Coordinate with Owner on numbering/labeling scheme.

B. Provide labeling for all security cable/wiring using waterproof, self-adhesive computer printed labels.

1. Coordinate with Owner on numbering/labeling scheme.
2. Label all cables/wiring on both ends.
3. At multi conductor cable terminations label each conductor.
4. At a minimum, each cable/wire label shall designate:

a) Origination Point
b) Alarm point description
c) Opening description (if applicable)

C. Provide a complete cable/wire identification plan/list with project completion submittal.
D. Conduit and junction box exteriors may be identified with unique color paint, but shall not be identified with written words that easily identify the function of the conduit and boxes.

3.5 POWER REQUIREMENTS

A. 120 VAC emergency power dedicated to security will be provided. (By Electrical Contractor)
B. Back-up power for all equipment and devices shall be for at least 4 hours unless otherwise specified.

1. When generator backup power is available, provide a UPS, rated to maintain the load for a minimum of 15 minutes for all 120VAC equipment.

C. Rack-mounted Uninterruptible Power Supply (UPS)

1. Provide a UPS to support 120% of the required load to allow for future load expansion and age related deterioration of the battery performance.
2. The UPS interface port shall have an RS-232 communications port and a 10 Base-T Ethernet for LAN management.

    a) Provide the necessary data connection, hardware and software to remotely monitor the UPS
    b) Provide user configurable computer operating system shutdown capability

3. The control panel shall have a LED status display for load and battery bar graphs in addition to replace battery and overload indicators.

    a) Rack-mounted surge suppression shall be vertically mounted and made for this orientation.

D. All electronic locks shall be 12/24VDC (By Division 08)
E. Connect to AC power and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.

1. Provide uninterrupted battery backup power for the duration required above.

F. All equipment connected to AC circuits shall be protected from power surges.

1. The devices shall be installed and grounded per manufacturer instructions.
2. Equipment protection shall meet requirements of ANSI C62.41.
3. Fuses shall not be used for surge protection.

G. All non-fiber optic data circuits that serve devices exterior to the buildings will be protected by surge protectors at the device and the termination.

1. The devices shall be installed and grounded per manufacturer instructions.
2. Equipment protection shall meet requirements of ANSI C62.41.
3. Fuses shall not be used for surge protection.

3.6 TESTING

A. Ensure that all provisions and requirements of this specification are met.

1. Verify through inspections, demonstrations and tests.

B. Perform required tests to demonstrate workmanship, operation, and performance.

1. Conduct tests with Architect/Owner and if required, inspectors of agencies having jurisdiction present.
2. Arrange test dates in advance and give all parties a minimum of 48 hours notice.

C. Repair or replace equipment or systems found defective or inoperative and re-test until 100% satisfactory results are obtained.
D. Verification inspections will be made of all equipment components and installations for proper functioning of locking hardware and lock controls, mounting/placement

of sensors, and cameras, etc. to guarantee requirements of the Contract Documents are complied with.

1. The Owner's quality control representative shall have the opportunity to witness all inspections, or to conduct installation inspections of his own.

3.7 FUNCTIONAL PERFORMANCE TEST

A. The Functional Performance Test (FPT) will be conducted at the end of the project and prior to system acceptance by the Owner.

1. The security integrator will provide all necessary staff and communications needed to fully test all functions of the system.
2. The contractor will submit for approval by the Architect and Owner, a comprehensive test plan that will include testing of every function on every door and security device thirty (30) days prior to the scheduled start of the test.
3. The system will not be considered for acceptance prior to the successful completion of the FPT and completion of punch list items.

B. Pre-Testing

1. Following installation and prior to the FPT, the security integrator shall individually test each component and field device and verify the proper functioning of each component within a particular sub-system.

a) The contractor shall also test each sub-system until all detection zones, alarm assessment components, alarm reporting, surveillance and display components; along with access control functions have been verified.
b) Prior to the FPT all deficiencies must be corrected.
c) After sub-system verification is complete, test the entire system to assure that all elements and subsystems are compatible and function properly as a complete system.

C. Upon completion of the outlined tasks and tests the security integrator shall schedule the FPT with the Architect and Owner.

1. The security contractor must demonstrate that the security system components and sub-systems operate together as a system and meet specification requirements in the "As-Installed" operating environment.
2. On conclusion of the FPT the test report document will be submitted to the architect for approval.
3. The FPT will be observed by the architect's and Owner's representatives.
4. The FPT may be stopped at any time by these representatives if they believe the failure rate is too high or the system is not performing to contract document requirements.
5. The FPT will only resume when all deficiencies have been corrected.
6. Retesting will be required of all failed tests.

3.8 SYSTEM OPERATIONAL TEST

A. Upon completion of the FPT, conduct a formal test to be known as the System Operational Test (SOT), in which all components and sub-systems of the security system are demonstrated to operate error and failure free together as a system.

1. This test is to be performed over a continuous seventy-two (72) hour period.
2. A formal test plan and test procedures shall be prepared by the security subcontractor and submitted to the Owner/Architect for approval.
3. The Security integrator must demonstrate that the system components and sub-systems meet specification requirements in the “As-Installed” operating environment and operate error and failure free for the duration of the test.
4. If a system failure does occur, the failure must be documented and repaired, after which the seventy-two hour SOT period will restart.

B. In the event that the Owner, Architect, or Contractor are required to witness a retest at a later date because the Security integrator is not properly prepared to conduct the acceptance tests or because the systems being tested have failed such tests, which shall be solely determined by the Architect or Owner witnessing the tests, the cost of witnessing additional tests shall be borne exclusively by the Security integrator.

1. Costs are to be based on time and materials at the established rates of the Architect or Owner.

END OF SECTION

SECTION 281000
ELECTRONIC ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY/OVERVIEW

A. This section provides specifications for the installation of Electronic Access Control (AC), Intrusion Detection (ID), and related components.

B. Related Sections

1. Section 087100 Door hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 280000 Electronic Security
5. Section 282300 Video Surveillance
6. Section 282600 Intercommunications
7. Section 283100 Fire Alarm and Smoke Detection

1.2 REFERENCES

A. See Section 280000 Electronic Security.

1.3 SYSTEM COORDINATION

A. The Security Integrator shall completely coordinate all relevant work of other trades/systems including, but not limited to:

1. Door hardware
2. Fire Alarm System
3. Electrical Systems(s)
4. Telecommunications System(s)

B. Electric Locking Mechanisms

1. The security integrator and door hardware contractor shall coordinate all door hardware, door and door frame design.
2. The security contractor shall verify all specified door hardware is appropriate for the security application and verify the sequence of operations for each access controlled opening.

C. Fire Alarm and Life Safety

1. The security integrator shall coordinate the access control system design with the life safety consultant to ensure compliance with applicable codes and requirements.
2. This includes, but is not limited to:

a) Fire alarm interface

b) Fail safe/fail secure locking mechanisms
c) Delayed egress

1.4 SYSTEM DESCRIPTION

A. General Requirements

1. Furnish all labor, materials, tools, equipment, and services for a complete security system as indicated and in accordance with provisions of the contract documents.
2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
3. Comply with the provisions of Division 1 for General Requirements.

a) In the event of a conflict between the provisions of this Section and Division 1, the more stringent provisions shall apply.

4. All system devices and components included shall be compatible.

B. Provide an AC/ID system to support project requirements as specified herein.

1. The AC/ID system will support the completed facility and accommodate cardholder enrollment.

C. Provide AC/ID workstations as indicated on the drawings.

1. The AC/ID system will be connected via the Owner's Local Area Network (LAN) for control and monitoring.
2. Coordinate AC/ID programming with the Owner to ensure that all systems and alarm points report at appropriate monitoring locations.
3. Refer to Section 282300 for additional requirements.

D. The AC/ID system shall be interfaced with the Fire Alarm system (by others) as required to comply with all building code requirements.
E. Emergency/UPS power will be provided by electrical contractor to power:

1. AC/ID workstations
2. AC/ID Data Gathering Panels (DGPs)
3. AC/ID rack mounted equipment

1.5 ACCESS CONTROL SYSTEM

A. The AC system will consist of host computer, computer workstations, software, card readers, access card printers, access cards, Data Gathering Panels (DGPs), door position sensors, and request-to-exit sensors operating in conjunction with associated electric door hardware.

1. AC Host Computer

a) Provide AC host computer hardware and software in accordance with manufacturer specifications for a system with the following capacity:

1) AC Workstations: 5 concurrent
2) AC Badging Workstations: 3
3) Card readers: 128
4) Alarm points: 1,000
5) Control points: 1,000
6) Cardholders: 1,000

b) The AC system will communicate via the Owner's Local Area Network (LAN).

c) The security subcontractor is responsible to coordinate setup and programming to ensure that all systems and alarm points report correctly at the remote location.

d) AC software must be compatible with DGPs specified herein. Provide operating system, software and database in accordance with AC manufacturer specifications.

e) Provide AC software with integrated access credential management software suite with the following functional requirements:

1) Cardholder enrollment
2) Cardholder identity management
3) Cardholder image capture and insertion
4) Integration with Owner's HR database to include automatically populating AC cardholder identity via HR employee database transfer to AC system.
5) Printing of color coded badges to differentiate cardholder type e.g., visitor, contractor, full time employee. Confirm cardholder types and badge colors schemes with the Owner.
6) Create and insert badge graphics, watermarks and images.
7) Card printing, encoding & programming.
8) Apply over laminate to front and back of card

f) Provide AC software that may be expanded via software license upgrade. AC software expansion must not require replacement of host computer operating system and database. Provide AC software that may be expanded to accommodate the following system capacity:

1) AC Workstations: 25 concurrent
2) AC Badging Workstations: 10
3) Card readers: 2,500
4) Alarm points: 5,000
5) Control points: 5,000
6) Cardholders: 10,000

g) AC software shall support map creation and display

2. Card readers and adjunct devices shall be provided as shown on the drawings.

a) Provide card readers, Data Gathering Panels <DGP>, and alarm input and output devices connected to the security management system via Local Area Network (LAN).
b) The security integrator shall coordinate network and IP address requirements with Owner to identify the Media Access Control (MAC) address (Layer 2) of each provided device, the location to be installed, and the port configuration needed for communication.
c) Furnish all labor, materials, tools, equipment, and services for a complete system as indicated and in accordance with provisions of the contract documents.
d) Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.

B. Data Gathering Panel (DGP)

1. Controller

a) Power: 12-24 VDC
b) Communications: Primary 10/100 Ethernet; Secondary RS-232, RS-485, modem
c) Alarm inputs: Cabinet tamper and power monitor
d) Battery backup: Onboard memory and clock
e) Standards: UL294 recognized, CE compliant, ROHS
f)Access Control: 600,000 cardholder capacity, 50,000 transaction buffer

2. Card Reader Interface

a) Power: 12-24 VDC
b) Outputs: 6 form-C
c) Inputs: 8 unsupervised/supervised; 2 unsupervised cabinet tamper and UPS fault.
d) Card reader capacity: Two
e) Card reader interface: 12VDC reader power
f)Card reader port compatibility: Wiegand data 1/data 0; magnetic clock/data; F/2F single wire; Open Supervised Device Protocol

3. Alarm Input Interface

a) Power: 12-24 VDC
b) Outputs: 2 form-C, 5A
c) Inputs: 16 unsupervised/supervised; 2 unsupervised cabinet tamper and UPS fault
d) Communications: RS-485

4. Output Control Interface

a) Power: 12-24 VDC
b) Outputs: 16 form-C, 5A
c) Inputs: 2 unsupervised cabinet tamper and UPS fault.
d) Communications: RS-485

C. Access Card:

1. Technology: 125 kHz proximity and 13.56 MHz contactless smart card.
2. Size: CR-80
3. Compatibility: Provide card format compatible with Owner's existing HID 125 kHZ card readers and access control systems.

D. Card readers will work such that upon presentation of a valid AC card, the unique card data shall be transmitted to an associated control panel where the data is compared to an authorized user database and access is approved or rejected accordingly.

1. A valid authorization will activate operation of the electric lock and shunt the door position switch. The alarm shunt will not affect supervision of the detection circuit.
2. Coordinate with owner on card format and other pertinent details.

E. Card readers shall support both 125 KHz proximity and 13.56 MHz smart card technologies

F. Door position switches at card reader controlled location serve to indicate the open/closed status of the associated door and shall establish the basis for reporting a door-propped or unauthorized entry condition.

1. Provide door position switches as indicated on drawings.
2. Security contractor is responsible for coordinating the contact configuration (SPDT) (DPDT) and rating for door position switches, and for connection of switches with the AC.

G. Electrified door hardware for card reader controlled doors will include electrified locksets, electric exit devices, and electric power transfer as shown on the drawings.

1. All electrified door hardware shall be provided under the work of Division 08 unless otherwise noted.
2. Security subcontractor shall provide security cables/conductors and low voltage power supplies for security system controlled electric door hardware.

H. Request-to-exit (REX) devices at designated card reader controlled doors shall cause the associated door position switches to be shunted.

1. The alarm shunt shall not affect the supervision of the alarm detection circuit.
2. Electrified Lockset shall have an integral REX switch
3. Electrified Exit devices shall have an integral REX switch
4. Magnetic Locks shall have a Passive InfraRed (PIR) motion sensor REX device.

a) Wire the PIR to the Door REX Input. The configuration on this motion shall be non-resettable and activate for only 2 seconds.

b) A second set of output contacts for the REX motion sensor shall be wired in series with the power to the lock, disconnecting power to the lock when motion is sensed.
c) The PIR REX shall be mounted and the sensor positioned to avoid detection more than three feet from the door and at the door bottom sweep.

1) Deter under door spoofing attacks by pointing the sensor away from the door threshold. Position the sensor to detect motion at the door handle or door push plate.

d) Connect to REX switch in exit device (by Division 8).

1) Coordinate with Division 8 to ensure proper REX switch configuration
2) Wire the REX switch as described for the above motion sensor to disconnect power to the lock and activate the REX input on the DGP.

e) Doors with out exit devices, a UL listed double pole pushbutton exit switch shall be provided as a redundant REX device.

1) It shall be wired as described for the above motion sensor to disconnect power to the lock and activate the REX input on the DGP.
2) Locate within 6’-0” of the door push-plate/handle.

I. Remote Door Release Button

1. Designated doors equipped with electric locking devices that can be released from a remote location through the use of a door release push-button.

a) The momentary push-button shall interface to a DGP auxiliary input to provide momentary lock release and door alarm shunt. Interface will include supervised circuit terminated to normally open DGP input.
b) Assign the remote door release pushbutton a unique identifier in the access control system database and record door release pushbutton events in the access control system database.

1.6 SUBMITTALS

A. Follow provisions of Section 280000 additional requirements.
B. Field Test Reports

1. Upon completion and testing of the installed system, test reports shall be submitted in booklet form and electronic media showing all field tests performed on, and adjustments made to each/any component and all field tests performed to prove compliance with the specified performance criteria.

2. Indicate and interpret test results in written form and verbally to owner/DataCom for compliance with performance requirements at a pre-scheduled meeting.

C. Battery calculations to show the expected loads and backup duration for power supplies and UPS devices for all active AC/ID equipment.
D. Security Contractor is responsible to prepare and submit as required to the Authority Having Jurisdiction (AHJ) any and all information to obtain an Electronic Locking Mechanisms permit.

1.7 QUALITY ASSURANCE

A. Follow provisions of Section 280000.
B. Spare Parts:

1. Provide the following spare parts:

a) One (1) of each type of surface mounted door position sensor
b) Two (2) concealed door position sensor
c) One (1) of each type of card reader and card reader/keypad
d) Access control data gathering panel

1) One (1) network controller
2) Two (2) card reader interface board

1.8 DELIVERY, STORAGE AND HANDLING

A. Follow provisions of Section 280000.

1.9 PROJECT/SITE CONDITIONS

A. Follow provisions of Section 280000.

1.10 WARRANTY

A. Follow provisions of Section 280000.
B. All devices and components shall comply with applicable U.L. standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SYSTEM MANUFACTURERS

A. AC System Platform Software

1. Infinias Access Control

B. System Platform Server (By Owner)

1. Dell
2. Hewlett Packard

3. IBM
4. Owner Approved Equivalent

C. Workstation (refer to 282300)

2.2 ACCEPTABLE ACCESS CONTROL MANUFACTURERS

A. Access Control Data Gathering Panels <DGP>

1. AC/ID System compatible
2. Owner Approved Equivalent

B. Door Controllers

1. 3XLOGIC

C. Proximity Card Readers <CR>

1. HID
2. XceedID
3. Owner Approved Equivalent

D. Door Position Switches <DP>

1. Concealed Magnetic Door Position Switch

a) George Risk Industries (GRI) 199-12
b) Sentrol 1076D
c) Owner Approved Equivalent

E. Electric Locking Mechanism Power Supply

1. Altronix
2. Alarm-Saf
3. LifeSafety Power
4. Owner Approved Equivalent

F. Electric Locking Mechanisms (By Division 08)

1. Sargent
2. Schlage
3. Von Duprin
4. Locknetics
5. Owner Approved Equivalent

G. Electric Power Transfer (By Division 08)

1. Security Door Controls (SDC)
2. Schlage
3. Von Duprin
4. Owner Approved Equivalent

H. Uninterruptible Power Supply <UPS> Provided by owner

1. Eaton UPS

a) 5S series for workstations
b) 9170 for rack mounted equipment

2. APC Smart-UPS Series

a) SMT series for workstations
b) Smart-UPS on-Line series for rack mounted equipment

3. MinuteMan

a) Pro series for workstations
b) Enterprise Plus series for rack mounted equipment

4. Owner Approved Equivalent

I. Wire & Cable

1. Belden
2. Windy City
3. General Cable
4. Owner Approved Equivalent

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Power Supplies

1. Power supply requirements

a) A switch and on/off indicator within the power supply cabinet.
b) Four hours of sealed gel battery backup to provide continuous operation during power failure.

1) Provide batteries as required to provide specified battery backup time for a fully loaded power supply, regardless of the connected load.

c) A battery charger to maintain the battery.
d) Low battery and power fail contacts to monitor the status of the input power and the battery.

1) Connect each power supply low battery and power fail alarm as a separate alarm input into DGP.

e) Key lockable wall mount metal enclosure with tamper switch.

2. Additional DGP Power Supply Requirements

a) The DGP power supply provides power only to DGP's and shall not provide power for locks or any other low voltage device.

3. Additional Electric Locking Mechanism Power Supply Requirements

a) Fail secure electric locking mechanisms shall remain locked during power failure and fire alarm conditions.
b) Connect fail safe locking devices in accordance with applicable life safety codes to unlock automatically under the following conditions:

1) Loss of power to the power supply
2) Failure of the power supply
3) Fire alarm activation

c) Provide power distribution boards with independently fused output relays and fire alarm control panel interface.

4. Additional Device Power Supply Requirements

a) Provide device power supplies for other security system devices requiring power (e.g. card readers, local alarms, motion sensors, etc.)
b) Provide power distribution boards with independently fused outputs.

B. Video Surveillance System Integration

1. Automatic Video Call-up

a) All alarms shall call up all cameras in the area of alarm to the screen of the ACID alarm operator workstation to allow for operator assessment of the alarm.

2. Pre and Post Alarm Video

a) The operator shall be able to view up to 10 seconds of video before the alarm and 30 seconds after the alarm for all cameras associated with the alarm.
b) This feature is to be integrated with the operator alarm notification to assist in alarm assessment.
c) This feature shall be displayed as an option on the alarm notification screen and will not require operator to make a manual video search.

3. Recording

a) All cameras whose field of view that include images of the area affected by the alarm, shall be recorded when an alarm is detected for use in forensic analysis, including the pre and post alarm video.

4. Duress and Emergency Intercommunications Integration

a) Calls from emergency intercoms/phones with cameras shall provide the above video call-up and the pre and post alarm video capabilities.

C. Tamper Resistant Screws

1. Provide appropriate screw heads for each application (e.g. countersunk heads for recessed cover plate screws, flat head screws for standard junction box covers, etc.).
2. The security integrator shall provide Torx® tamper resistant screws for:

a) Junction boxes located above doors
b) Junction boxes located below ceiling height and/or within reach of hatch ladders
c) Security device cover plates
d) Surface mounted door position switches and armored cable

3.2 ENCLOSURE INSTALLATION

A. Enclosures shall be lockable with a tamper switch and installed in a manner to be accessible with clearance to fully open enclosure door.
B. All security panels shall be wired through a dedicated power supply with battery backup.

1. Power to the data gathering panels is to be hardwired utilizing EMT or rigid conduit in accordance with the Electrical specifications.
2. A circuit from the Fire Alarm panel must be installed to each lock power distribution panel.

C. Enclosures shall be installed on designated wall fields in a neat and compact manner to allow for future growth.
D. Enclosures shall be sized to allow for 20% growth in each panel.
E. All panels and boards shall be installed in enclosure(s) suitable to their environment and have sufficient size and orientation to include all system components.
F. Each panel shall be labeled accordance with Owner standards.

The label for each panel shall be posted on the exterior of the panel door.

a) Each panel shall have a list of devices connected to it located on the inside cover.
b) A detailed device layout drawing will be located on the inside of the panel door in an appropriate sleeve and keeper.

3.3 FURTHER REQUIREMENTS

A. Refer to provisions of Section 280000.
B. Furnish and coordinate installation of all special device back boxes and ACID field devices as shown on the security drawings and as specified in this section.
C. The exact installation locations of all equipment shall be coordinated and verified with the Contractor prior to installation.

1. Subcontractor shall notify the Contractor if any location appears to be unsuitable.

D. Provide low voltage power supplies for electric locking devices and ACID devices and components as shown on the security drawings and specified in this Section.
E. Coordinate with the Telecommunications Subcontractor for data network connections, IP address requirements, and telephone circuits as required.
F. Prepare all systems for user operation.

    1. The security system must be complete and ready to operate prior to Owner final acceptance of the system.

G. Coordinate with the Owner for all system programming requirements.
H. Perform database programming as required to support the card reader, alarm point, surveillance system integration, and control panel configuration as required.

END OF SECTION

SECTION 282300
VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY/OVERVIEW

A. This section provides specifications for the installation of an IP based Video Surveillance System (VS) and related components.
B. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications (including related sub-sections)
3. Section 280000 Electronic Security
4. Section 281000 Electronic Access Control
5. Section 282600 Intercommunications

1.2 REFERENCES

A. See Section 280000 Electronic Security.
B. NDA (National Defense Act) Compliant

1.3 SYSTEM DESCRIPTION\

A. Provide a Video Surveillance (VS) system to support project requirements as specified herein. The VS will consist of Network Video Recorders (NVRs), computer workstations, software and software licenses, surveillance cameras, Uninterruptible Power Supply (UPS), and Video Decoder, Monitor and Mount, wiring & cabling, and low voltage camera power supplies.

1. The VS system will support the completed facility.
2. The VS system will be expandable to accommodate surveillance of all city facilities.
3. The VS system will be connected via the Owner’s Local Area Network (LAN) for camera control and monitoring.
4. Coordinate VS programming with the Owner to ensure that all cameras are viewable at appropriate monitoring locations.
5. The VS system shall provide for recording, local monitoring, and remote monitoring of cameras.
6. VS system surveillance and communication equipment shall be on emergency/UPS power.

B. Network Video Recorder and Software

1. Provide NVR hardware and software in accordance with manufacturer specifications for a system with the following capacity:

a) Workstations: 10 concurrent

b) Cameras: 256

2. The VS system will communicate via the Owner's Local Area Network (LAN).
3. The security subcontractor is responsible to coordinate setup and programming to ensure that all cameras are displayed correctly at each workstation.
4. VS software must be compatible with cameras specified herein. Provide operating system, software and database in accordance with VS manufacturer specifications.
5. Provide VS software that may be expanded via software license upgrade. VS software expansion must not require replacement of host computer operating system and database. Provide VS software that may be expanded to accommodate the following system capacity:

   a) NVRs: Unlimited
   b) Workstations: Unlimited
   c) Cameras: Unlimited

6. Provide VS software with the following features

   a) Simultaneous video record, playback, live view and video export
   b) Thick client, web client, mobile client for Apple iOS and Android OS
   c) Map graphic creation and display
   d) Video event search capability based upon:

      1) External alarm input
      2) Video motion

   e) Independent camera recording frame rate control
   f)Multiple monitor support
   g) Hybrid support and integration for IP and analog cameras

C. Camera assemblies include camera, lens, housing, and mount. Provide and install wiring and low voltage power from the security wall field/rack to the camera locations.

   1. Scope of work shall be complete from point of origin (camera) to point of termination (security rack).

D. Provide rack mount 1U monitor/keyboard/track ball drawer with 20" LCD monitor for display and programming, keyboard, track ball, and integrated four-port KVM switch.

   1. Provide additional KVM ports as required plus two spare ports if Work includes more than two NVRs.

E. Coordinate all work that must be performed in security head end spaces with the General Contractor, the Electrical Contractor, and the Telecommunications contractor. (if applicable)
F. Camera images shall support H.264 compression formats.
G. Provide NVR with 50% spare storage capacity for future expansion.

H. Camera lenses for fixed cameras shall be varifocal and sized to provide the owner approved field of view. The lens shall be IR corrected and have megapixel resolution.
I. Surveillance camera audio functions shall not be installed and/or disabled unless specifically requested by Owner.

1.4 SUBMITTALS

A. Follow provisions of Section 280000 for additional requirements.
B. Project Data

1. Provide a description of system operation indicating the purpose and capability of each device/component of the system with a functional diagram indicating all interfaces to other systems.

C. Video Quality test reports shall be provided for all cameras to confirm an optimum high definition video signal.
D. Shop drawings shall reflect all requirements associated with Owner provided or existing equipment and materials that will be used as part of this system.
E. Video Storage calculations to show the system capacity can accommodate the specified video retention.
F. Battery calculations to show the expected loads and backup duration for camera power supplies and UPS devices for all active surveillance equipment.
G. System programming, camera titles, descriptions, camera images and database

1. Camera titles and descriptions prior to system programming
2. Programming/database prior to performance testing
3. Provide a cross reference between specified camera numbers and programmed camera numbers
4. Final programming, camera images and system documentation on electronic media to Owner

H. Product Data

1. Manufacturer’s technical data sheets and specifications

1.5 QUALITY ASSURANCE

A. Follow provisions of Section 280000.
B. Spare Parts:

1. Provide the following spare parts:

a) One (1) of each type of surveillance camera

2. The security integrator will turn over the new and unused components and devices to the owner at project closeout.

1.6 DELIVERY, STORAGE AND HANDLING

A. See Section 280000.

1.7 PROJECT/SITE CONDITIONS

A. See Section 280000.

1.8 WARRANTY

A. See Section 280000.

PART 2 - PRODUCTS

2.1 CAMERA SPECIFICATIONS – NDA Compliant

A. All cameras shall be a Dome Camera unless otherwise specified

1. Compatible with the VMS
2. Vandal resistant with polycarbonate dome
3. Wide Dynamic Range Feature: All exterior cameras and interior cameras that have exterior lighting or headlights in their field of view shall have a Wide Dynamic Range feature to improve picture quality in situations with strong backlighting.
4. Multi-stream so that recording and viewing can be at different frame rate and compression.
5. Day-night Color/B&W camera with cut filter
6. Exterior cameras:

    a) Include a heater to permit fog-free viewing in low temperatures
    b) Fan to prevent overheating in high temperatures (as required)

B. Interior Fixed Dome Camera:

1. Resolution shall be a minimum of 2MP (1080p) at 30 FPS
2. Shall be IP, PoE IEEE 802.3af
3. Smoked lower dome
4. Include an SD card sized to allow for scheduled and event based storage of images
5. Varifocal auto-iris fixed lens sized to provide the owner approved field of view
6. Size camera and lens for facial recognition at a minimum of 60 pixels per foot at the target location
7. Shall have a minimum sensitivity of 0.05 Lux at 30 IRE

C. Interior Multi Sensor 180º, 270º, and 360º Camera:

1. Resolution shall be a minimum of 8MP at 30 FPS (4x 1080p)
2. Shall be IP, PoE IEEE 802.3af
3. Smoked lower dome
4. Include an SD card sized to allow for scheduled and event based storage of images
5. Allows for up to 4 multiple views
6. Varifocal auto-iris fixed lens sized to provide the owner approved field of view.

7. Size camera and lens for facial recognition at a minimum of 60 pixels per foot at the target location
8. Shall have a minimum sensitivity of 0.17 Lux at 50 IRE

D. Exterior Fixed Dome Camera:

1. Resolution shall be a minimum of 2MP (1080p) at 30 FPS
2. Shall be IP, PoE IEEE 802.3af
3. Clear lower dome, unless otherwise specified
4. Include an SD card sized to allow for scheduled and event based storage of images
5. Vari-focal auto-iris fixed lens sized to provide the owner approved field of view.
6. Outdoor rated to meet International Protection Rating (IP) 66
7. Shall have a minimum sensitivity of 0.05 Lux at 30 IRE

E. Exterior Multi Sensor 180º, 270º, and 360º Camera:

1. Resolution shall be a minimum of 8MP at 30 FPS (4x 1080p)
2. Shall be IP, PoE IEEE 802.3af
3. Clear lower dome, unless otherwise specified
4. Include an SD card sized to allow for scheduled and event based storage of images
5. Allows for up to 4 multiple views
6. Varifocal auto-iris fixed lens sized to provide the owner approved field of view.
7. Size camera and lens for facial recognition at a minimum of 60 pixels per foot at the target location
8. Outdoor rated to meet IP66
9. Shall have a minimum sensitivity of 0.17 Lux at 50 IRE

2.2 NETWORK VIDEO RECORDER – NDA Compliant

A. The Network Video Recorder shall be compatible with the video management system along with the following minimal requirements:

1. Hot swappable storage drives in a RAID 5 array
2. Dual hot swappable redundant power supplies
3. Support dual stream cameras
4. Include a dual Network Interface Card (NIC) that supports:

a) Full duplex
b) Fault tolerance
c) Link aggregation
d) Load Balancing
e) Traffic prioritization
f)Hot swap

5. Native support of H.264 compression that does not require the use of additional software or equipment

6. Provide a 20 inch 1080P service monitor and keyboard at each NVR equipment rack
7. Provide video storage capacity for 30 days using the following minimum criteria

    a) All cameras using H.264 compression
    b) Interior cameras: Use native camera resolution
    c) Exterior cameras: Use native camera resolution
    d) Wide angle lens cameras: Use native camera resolution
    e) Motion triggered recording

    1) Assume that motion will be detected 50% of the day
    2) Motion detection will be configurable by camera and schedule to mitigate nuisance triggers
    3) Record video at 12 FPS when motion is detected
    4) Record video at 1 FPS when no motion is detected

B. Coordinate with owner on the number of user licenses required
C. Provide UPS for backup power to the NVR and peripheral equipment

1. Follow provisions of Section 28000 for UPS power requirements
2. Coordinate with Division 26 to provide a dedicated Emergency Power circuit

2.3 WORKSTATION

A. Provide a fully configured high-speed workstation that will deliver acceptable performance with adequate hardware, processing capacity and peripherals to support the VMS, Access Control, Intrusion Detection systems and the owner provided business suite applications.

1. Coordinate with Section 281000 contractor for AC and ID requirements
2. Provide all required VMS application and required VMS administration software
3. Coordinate with owner’s IT department

    a) Workstation IP address
    b) Operating system
    c) Configuration
    d) Security requirements
    e) Business application software requirements

B. Provide two (2) high definition 30” monitors

1. Resolution: 1920x1080 with progressive scan
2. Widescreen16:9 aspect ratio

C. Provide UPS for backup power to the Workstation, Monitors, and peripheral equipment

1. Follow provisions of Section 280000 for UPS power requirements

2. Coordinate with Division 26 to provide a dedicated Emergency Power circuit

2.4 PoE NETWORK SWITCH – Owner Provided

A. Provide a fully configured rack mounted PoE Managed 10/100/1000Mbps Layer 3 Switch.

1. Coordinate switch make and model with Owner / Owner network representative prior to purchase to ensure compatibility with existing and non-surveillance related network appliances.
2. Coordinate with Owner / Owner network representative on video surveillance subnet assignment.
3. Switch port count shall allow for 10% growth.

2.5 ACCEPTABLE MANUFACTURERS

A. Video Management System (VMS) Platform Software

1. Aimetis Symphony
2. Avigilon
3. Genetec Omnicast
4. LenelS2 VRx
5. Milestone Systems
6. OnSSI Ocularis
7. Pelco VideoXpert
8. Salient Systems
9. Owner Approved Equivalent

B. NVR Server: Compatible with VMS Requirements

1. NVR specification compliant hardware

C. Workstation Hardware:

1. Dell
2. HP
3. Owner Approved Equivalent

D. Video Monitor:

1. LG
2. Optiquest
3. Samsung
4. Viewsonic
5. Owner Approved Equivalent

E. Interior Standard Fixed Camera

1. American Dynamics
2. Avigilon

3. Axis Communications
4. Bosch
5. Hanwha Techwin (Samsung)
6. Pelco
7. Sony
8. Vicon
9. Owner Approved Equivalent

F. Interior Multi Sensor 180º, 270º, and 360º Camera

1. American Dynamics
2. Avigilon
3. Axis Communications
4. Bosch
5. Hanwha Techwin (Samsung)
6. Pelco
7. Sony
8. Vicon
9. Owner Approved Equivalent

G. Exterior Standard Fixed Camera

1. American Dynamics
2. Avigilon
3. Axis Communications
4. Bosch
5. Hanwha Techwin (Samsung)
6. Pelco
7. Sony
8. Vicon
9. Owner Approved Equivalent

H. Exterior Multi Sensor 180º, 270º, and 360º Camera

1. American Dynamics
2. Avigilon
3. Axis Communications
4. Bosch
5. Hanwha Techwin (Samsung)
6. Pelco
7. Sony
8. Vicon
9. Owner Approved Equivalent

I. Wide Angle Megapixel Camera Lens

1. Computar
2. Theia
3. Owner Approved Equivalent

J. Camera Power Supply

1. Altronix
2. Alarm-Saf
3. LifeSafety Power
4. Owner Approved Equivalent

K. Equipment Racks and Racks Components: (By Division 27)

1. Chatsworth Products (CPI)
2. Ortronics
3. Newton Instruments
4. Owner Approved Equivalent

L. Lockable Equipment Cabinet and Components: (By Division 27)

1. Chatsworth Products (CPI)
2. Ortronics
3. Newton Instruments
4. Owner Approved Equivalent

M. Media Converter - Copper-to-Fiber Outdoor rated (Hardened for extreme temperatures)

1. Axis Communications
2. Pelco
3. IFS / UTC Security
4. Owner Approved Equivalent

N. PoE Network Switch – Owner Provided

1. Brocade
2. Cisco
3. Juniper
4. Arista
5. Owner Approved Equivalent

O. Video Wire & Cable

1. Windy City
2. General Cable
3. Belden
4. CommScope
5. Owner Approved Equivalent

P. Uninterruptible Power Supply (UPS) – Owner Provided

1. Eaton UPS

    a) 5S series for workstations
    b) 9170 for rack mounted equipment

2. APC Smart-UPS Series

a) SMT series for workstations
b) Smart-UPS on-Line series for rack mounted equipment

3. MinuteMan

a) Pro series for workstations
b) Enterprise Plus series for rack mounted equipment

4. Owner Approved Equivalent

PART 3 - EXECUTION

3.1 CONFIGURATION

A. Video Cameras

1. Provide day/night cameras in exterior locations
2. Lenses shall be field tested with Owner present to verify clear, crisp images and desired field of view

a) Substitute camera lenses as necessary to obtain required field of view at no additional cost
b) Provide spot filters for exterior lenses as required to reduce picture washout caused by sunlight

B. IP PoE Cameras

1. The security integrator shall coordinate network and IP address requirements with Owner to identify the Media Access Control (MAC) address (Layer 2) of each provided camera, the location to be installed, and the port configuration needed for communication.
2. Make all necessary adjustments to camera lenses to obtain clear, crisp images and desired field of view to the Owners satisfaction.

a) Substitute camera lenses as necessary to obtain required field of view at no additional cost.

1) Adjust all cameras to produce high-definition images with no blooming, streaking or noticeable lag.
2) Provide and install in-line PoE injectors as required when non PoE network switches are used or when manufacturer specified power is not available to the camera.
3) All camera power shall comply with the specified power requirements.

3.2 POWER REQUIREMENTS

A. Provide uninterruptible power supplies for all active surveillance equipment

1. Rack mounted components, including all active network communication hardware, shall be on an Uninterruptible Power Supply <UPS> system.

2. Refer to Section 280000 for UPS and power requirements
3. Camera power supplies shall be on an Auxiliary Power Supply <APS>, system as required, with a battery backup.

    a) The Auxiliary power supply shall be furnished with a power distribution panel with each camera individually fused or protected with an over-current protector.

B. Power supplies shall provide:

1. 120 VAC input and output voltage as required
2. UL Listed
3. Power fail contacts to monitor the status of the input power

    a) Connect each power supply power fail alarm as a separate alarm input into AC/ID system

4. Key lockable wall mount metal enclosure with tamper switch
5. Independently fused outputs

3.3 INSTALLATION

A. Refer to provisions of Section 280000
B. All surveillance system devices and components shall be compatible.
C. Review landscape drawings, Building Information Model (BIM) files, and field verify landscape and adjacent architectural structures to ensure that video surveillance camera views are on target and unobstructed.
D. Camera Housings and Mounts

1. Cameras shall include housings and mounts as indicated in the Drawings.

    a) Provide the smallest available housing for each camera application.

        1) Integrated miniature dome cameras are preferred

2. Wiring to cameras shall pass from the back-box through the mount and into the housing. Exposed wiring or conduit shall not be acceptable.
3. Provide sun shields for camera housings in outdoor locations exposed directly to sunlight.
4. Provide surge protection for power and copper video cables for exterior cameras at the camera and at the point of termination (security rack).
5. Field verify the exact camera location, position, and mounting prior to installation.
6. Roof mounted cameras shall use roof deck brackets.

E. Exterior pole mounted cameras, shall use fiber optic cable (refer to Division 27 for size and type).
F. Video Management Control System

1. System platform software shall be ‘open architecture’ allowing for compatibility and integration with other building automated systems.

2. The system shall allow for secure remote viewing of live and recorded video as required.

G. Provide labeling suitable to Owner for all major equipment components. Coordinate with Owner on numbering scheme to match existing. Major equipment components:

1. Video monitors, IP camera Patch Panels, PoE Switches (or mid-span units), Network Video Recorders (NVR), and fiber mux units (if required).

H. Coordinate with Telecommunication subcontractor for network and patch panel provisions for security connections in the IT room. (If applicable)

I. Coordinate with Owner for all system programming and database requirements.

1. Provide all programming, setup, camera and device titling and data entry
2. Camera and device title and descriptions shall be consistent for all components

J. Install all Point-to-Point wiring with appropriate terminal connections for every wire and component termination so that all connections are mechanically and electrically secure.

K. Install field wiring in continuous lengths, without splices.

L. Verify upon job completion that all wiring and terminations are clearly labeled to identify the wire and terminal.

M. Testing of the surveillance system includes checkout of installed cameras back to the Security head end equipment to confirm proper operation of camera assemblies. Security integrator shall provide all necessary test equipment to fully demonstrate proper performance of field devices. Copies of test results shall be included in the project completion submittals given to the Owner.

END OF SECTION

SECTION 282600
INTERCOMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY/OVERVIEW

A. This section provides specifications for the installation of Emergency Intercommunications and Duress (EID) system and related components.

1. Emergency Phones

B. Related Sections

1. Section 087100 Door Hardware
2. Section 260000 Electrical (including related sub-sections)
3. Section 270000 Communications (including related sub-sections)
4. Section 280000 Electronic Security
5. Section 281000 Electronic Access Control
6. Section 282300 Video Surveillance
7. Section 283100 Fire Alarm and Smoke Detection

1.2 REFERENCES

A. See Section 280000 Electronic Security.

1.3 GENERAL SYSTEM DESCRIPTION

A. General Requirements

1. Furnish all labor, materials, tools, equipment, and services for a complete system as indicated and in accordance with provisions of the contract documents.
2. Install per manufacturer’s recommendations.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, and devices incidental to or necessary for a sound, secure and complete installation.
4. Comply with the provisions of Division 1 for General Requirements.

a) In the event of a conflict between the provisions of this Section and Division 1, the more stringent provisions shall apply.

5. All system devices and components included shall be compatible.

B. The project shall be equipped with a system that is maintained by Jeferson County.

1. All work required within the project shall be furnished and installed by the project security contractor.

C. The Intercom system will support the needs of the project in accordance with these specifications.

1. The Intercom system shall have the capability for future expansion to support the security needs of the completed complex.

D. Intercom systems utilized for life safety shall comply with all applicable codes.
E. Emergency/UPS power will be utilized to power the Intercom system's components at the Security head end equipment location.

1.4 SYSTEM COORDINATION

A. The Security Integrator shall completely coordinate all relevant work of other trades/systems including, but not limited to:
B. Fire Alarm System

1. Electrical Systems(s)
2. Telecommunications System(s)

C. Fire Alarm and Life Safety

1. The security integrator shall coordinate the Intercom system with the life safety consultant to ensure compliance with applicable codes and requirements.

1.5 IP BASED VIDEO INTERCOM SYSTEM

A. Computer Based Master Station

1. Provide PTZ control of substation camera
2. Hands-free VOX communication
3. Door release control
4. Provide software and install on owner provided PCs
5. Provide microphone and speakers for owner provided PCs

B. Hardware Based Master Station

1. Provide PTZ control of sub station camera
2. Handset or Hands-free VOX/ PTT communication
3. Door release control
4. Wall or Desk Mounting
5. PoE (802.3af) powered

C. Video Sub Station

1. Digital PTZ color camera
2. Dry Contact for Door Release
3. LED illumination for nighttime viewing
4. IP addressable
5. PoE (802.3af) powered

D. Control Unit (as required)

1. Rack mounted

1.6 SUBMITTALS

A. Follow provisions of Section 280000 additional requirements.

1.7 QUALITY ASSURANCE

A. Follow provisions of Section 280000.
B. Spare Parts:

1. Provide the following spare parts:

a) One (1) emergency phone
b) One (1) of each type of intercom substation
c) One (1) emergency duress button

2. The security integrator will turnover the new and unused components and devices to the owner at project closeout.

1.8 DELIVERY, STORAGE AND HANDLING

A. Follow provisions of Section 280000.

1.9 PROJECT/SITE CONDITIONS

A. Follow provisions of Section 280000.

1.10 WARRANTY

A. Follow provisions of Section 280000.
B. All devices and components shall comply with applicable U.L. standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SYSTEM MANUFACTURERS

A. Video Intercom System

1. Aiphone
2. Commend
3. Siedle
4. Stentofon
5. Owner Approved Equivalent

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Power Supplies

1. Provide device power supplies for all security system devices requiring power
2. Emergency Phone power shall be provided via PoE
3. Provide power distribution boards with independently fused outputs.
4. Power supply requirements:

a) Sealed gel battery backup to provide continuous operation during power failure.

1) Provide batteries as required to provide specified battery backup time for a fully loaded power supply, regardless of the connected load.

b) A battery charger to maintain the battery.
c) Low battery and power fail contacts to monitor the status of the input power and the battery.
d) Key lockable wall mount metal enclosure with tamper switch.

B. Video Surveillance System Integration

1. Automatic Video Call-up

a) Intercom / Phones shall position PTZ cameras and call-up all cameras in the area, to the alarm assessment workstation
b) Record video of alarm calls

C. Tamper Resistant Screws

1. Provide appropriate screw heads for each application (e.g. countersunk heads for recessed cover plate screws, flat head screws for standard junction box covers, etc.).
2. The security integrator shall provide Torx® tamper resistant screws for:

a) Security device cover plates
b) Duress buttons

3.2 FURTHER REQUIREMENTS

A. Refer to provisions of Section 280000.
B. Furnish and coordinate installation of all special device back boxes and field devices as shown on the security drawings and as specified in this section.
C. The exact installation locations of all equipment shall be coordinated and verified with the Contractor prior to installation.

1. Subcontractor shall notify the Contractor if any location appears to be unsuitable.

D. Labeling

1. Provide labeling suitable to Owner for all major equipment components.

a) Coordinate with Owner on numbering scheme to match existing.

2. Provide labeling for all security equipment racks and enclosures.
3. Provide labeling for all security device wiring.

a) Label all cables and wiring using waterproof, self-adhesive computer printed labels. Label both ends of each cable.
b) At multi conductor cable terminations label each conductor.

E. Coordinate with the Telecommunications Subcontractor for data network connections and telephone circuits as required.
F. Prepare all systems for user operation.

1. The security system must be complete and ready to operate prior to Owner final acceptance of the system.

G. Coordinate with the Owner for all system programming requirements.
H. Perform database programming as required to support the security sub-system integration, and control panel configuration as required.

END OF SECTION

SECTION 31 00 00
EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and perform all excavation, backfill, fill and grading required to complete the work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; excavation and backfill for electrical manholes, handholes, conduits, cables, raceways, and ducts; embankment and grading; disposal of waste and surplus materials; and all related work such as sheeting, bracing, and dewatering.

B. All excavation, trenching and related sheeting, bracing, etc, shall conform to the requirements of the Texas "State Safety Act" (CS/SB 2626) which incorporates, by reference, OSHA's excavation safety standards, 29 CFR 1926.650 Subpart P.

C. Excavation, backfill, and compaction for structures and piping are included in other sections as listed below.

1.02 RELATED WORK

A. Dewatering and Drainage is included in Section 312319 and 014127.

B. Structural Excavation Backfill and Compaction is included in Section 312319.

C. Trenching, Bedding and Backfill for Pipe is included in Section 312323 and 314000.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) 1. ASTM C33 - Specification for Concrete Aggregates.

1. ASTM Dl557- Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,00 ft-lbf/ft (2,700kN-m/m)

2. ASTM D1682- Standard Test Methods for Breaking Load and Elongation of Textile Fabrics.

3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.

4. ASTM D4751- Standard Test Method for Determining the Apparent Opening Size of a Geotextile.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 PROTECTION

A. Sheeting and Bracing

1. Furnish, put in place and maintain such sheeting and bracing as may be required: by Federal, State and local safety requirements; to support the sides of excavations; to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill.

2. In order to protect adjacent structures, installation or removal of sheeting by vibratory or hammering methods shall not be allowed.

3. Construct the sheeting outside the neat lines of the foundation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.

4. Where sheeting and bracing is required to support the sides of excavations for structures, engage a professional Engineer, registered in the State of Texas to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional Engineer. Submit P.E. Certification Form contained in Section 01 33 23 to show compliance with this requirement.

5. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed.

6. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from
or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe and under no circumstances shall any sheeting be cut off at a level lower than 1-ft above the top of any pipe.

B. Pumping and Drainage

1. At all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. Engage a Geotechnical Engineer registered in the State of Texas to design the dewatering system in accordance with Section 312319 prior to commencing work.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Take all additional precautions to prevent uplift of any structure during construction.

4. Remove the dewatering equipment after the system is no longer required.

1.05 SOIL TESTING

A. Previous to the general placement of the fill and during such placement, the ENGINEER may select areas within the limits of the fill for testing the degree of compaction obtained. Cooperate fully in obtaining the information desired.

B. Payment for testing will be made by the CONTRACTOR as part of the project. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the ENGINEER, will be borne by the CONTRACTOR.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select Common Soil and Structural Fill shall be as specified in Section

312323. B. Common soil shall be as specified in Section 312323.

C. Crushed Stone

1. Crushed stone shall conform to Texas Department of Transportation Class 57 stone gradation.

D. Screened Gravel

1. Screened gravel shall be used for pipe bedding as detailed and at other locations indicated on the Drawings.

2. Screened gravel shall consist of hard, durable, rounded or subangular particles of proper size and gradation and shall be free from sand, loam, clay, excess fines and deleterious materials. The gravel shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
5/8-in	100
1/2-in	40 to 100
3/8-in	15 to 45
No.10	0 to 5

PART 3 EXECUTION

3.01 BACKFILLING - COMMON FILL

A. Common Fill may be used as trench backfill and fill against exterior walls of structures as indicated on the Drawings; as embankment fill; or in other areas as designated by the ENGINEER. Material conforming to the requirements of common fill shall be placed in layers having a maximum thickness of 2-ft measured before compaction.

B. Common Fill shall be compacted to at least 95 percent of maximum density as determined by ASTM D1557, Method D.

C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawings making do allowance for settlement of the material and for the placing of loam thereon.

D. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan and no soft spots or uncompacted areas will be allowed in the work.

E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

3.02 DISPOSAL OF SURPLUS MATERIAL

A. No excavated materials shall be removed from the site of the work or disposed of, except as specified by the ENGINEER. Materials shall be neatly piled so as to inconvenience as little as possible the public and adjoining property OWNERS until used or otherwise disposed of as specified below.

B. Suitable excavated material shall be used for fill embankments or backfill on the different parts of the work as required.

C. Surplus fill shall become the property of the CONTRACTOR and shall be removed and disposed offsite.

3.03 DISPOSAL AND REPLACING OF ROCK

A. Remove and dispose of all pieces of ledge and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere on the work, insofar as it is available. Any deficiency in the backfill material shall be made up with acceptable material approved by the ENGINEER.

B. Fragments of ledge and boulders smaller than 50 lb weight may be used in backfilling trenches unless in the opinion of the ENGJNEER the quantity is excessive, in which case he/she may order the removal and disposal of some of this rock. The small pieces of rock used as backfill shall not be placed in trenches until the pipe has at least 2-ft of earth over it. Place these pieces of stone in thin layers alternating them with earth to be sure that all voids between the stones are completely filled with earth to prevent the occurrence of voids and settlement which will result therefrom.

C. Rock may be used in embankment fill only with the approval of the ENGJNEER.

3.04 GRADING

A. Grading in preparation for placing of loam, planting areas, paved walks and drives and appurtenances shall be performed at all places that are indicated on the Drawings, to the lines, grades and elevations shown and otherwise as directed by the ENGINEER and shall be performed in such a manner that the requirements for formation of embankments can be followed. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

B. If at the time of grading it is not possible to place any material in its final location, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, in order to obtain satisfactory construction.

D. Stones or rock fragments larger than 4-in in their greatest dimensions will not be permitted in the top 6-in of the finished subgrade of all fills.

END OF SECTION 31 00 00

SECTION 31 00 00
EARTHWORK UNDER BUILDING PAD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Protecting and preserving trees and vegetation to remain.

B. Clearing, stripping, and grubbing of portions of sites which are below the building pads.

C. Stockpiling stripped topsoil in approved locations.

D. Excavating for and otherwise providing stable and compact subgrade below the building pads.

E. Placing and compaction of select fill under improved areas to conform to elevations indicated on the drawings.

F. Filling and finish grading of area around buildings and other improvements using previously stripped topsoil and additional topsoil that must be purchased and delivered to the site.

G. Coordinating Work of other Sections affecting or affected by Work of this Section.

1.2 INSPECTION OF SITE

A. By making a proposal on the Project, the Contractor acknowledges:
   1. That the Owner and Architect do not guarantee the accuracy, completeness, or suitability of the contents of the Geotechnical Report or Topographic Survey.
   2. That he/she has visited the site to investigate the conditions affecting the Work and has satisfied himself/herself of the character, quality and quantity of surface and subsurface materials or obstacles to be encountered.

B. The Contractor will be required to establish, maintain and be responsible for all reference points, hubs, grades, elevations, lines, and surface measurements. If any discrepancies in the documents are found, the Contractor shall promptly notify the Architect and await instructions before proceeding.

1.3 QUALITY ASSURANCE

A. Inspection and Testing Laboratory Services: Test results shall meet or exceed the standards referenced.

1.4 REFERENCES

A. ASTM International (ASTM)

1. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3) – Test for Moisture Unit Weight Relations of Soils and Soil Aggregate.
2. D2922, Tests for Density of Soil and Soil Aggregate in place by Nuclear Methods.

1.5 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13- Project Management and Coordination.

PART 2 - MATERIALS

2.1 MATERIALS

A. Structural Fill: Sandy clay soils free of organic or other deleterious materials, and have a maximum clay lump size of less than three (3) inches. See Construction Documents for Liquid Limit and Plasticity Index per soils report.

B. Earth Fill: Shall be excavated material approved by Architect prior to its use as earth fill around building and landscaped areas, but not under building.

C. Stabilization Materials: Refer to stabilization section(s) in Division 31.

D. Topsoil: Shall be imported, and shall be free from clay, vegetation, debris, stumps, roots, stones larger than 3/4 inch diameter, or other objectionable matter.

PART 3 - EXECUTION

3.1 GENERAL

A. Unknown Utilities and Obstacles:
1. If any unknown or uncharted utilities or objects are encountered during excavation, promptly notify the Architect before proceeding. Arrange with utility and telephone companies for removal and relocation of their equipment, and capping of pipes and wiring as required.

B. Protection of Vegetation:

1. Rope or fence off areas of the site that are designated to remain with vegetation to prevent vehicular traffic and construction damage.
2. Provide wood barricades around trees and shrubs at their drip line in traffic areas to protect them from construction operations until Substantial Completion, or until barricade removal is directed by Architect.
3. Replace damaged trees and vegetation designated to remain with vegetation of equal kind and size. Follow supplier's recommended procedures for planting necessary replacement vegetation.

C. Clearing, Stripping and Grubbing (General):

1. Remove brush, vegetation, debris, and surplus materials from the jobsite. Removal of other remaining impediments as may be necessary to properly execute the scope of this contract shall be included herein. Adhere to State and local code requirements for the disposal of trees and shrubs removed from the site.
2. Do not remove trees or shrubs without the specific approval of the Architect. Vegetation damaged, removed, killed, or constricted from normal growth patterns shall be replaced with a comparable item, or the full replacement amount credited to the Owner.

D. Drainage, Pumping and Grading:
1. Proper drainage of site shall be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit access to the site.
2. Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas of building or damaging other structures.
3. Provide pumping required to keep excavated spaces clear of water during construction.

4. If any subgrade is damaged due to flooding, damaged area shall be removed and filled with select fill. Placement and compaction of select fill shall meet the requirements for placing and compacting select fill as specified below.
5. If the subgrade, due to any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.2 BUILDING FOUNDATION (PAD) PREPARATION

A. Site preparation area at buildings with and without adjacent sidewalks shall extend beyond the limits of the foundation area. See Construction Documents for Site Preparation limits.

B. Existing fill material, top soil vegetation, roots, debris, organic material and other miscellaneous debris shall be removed to a depth of 6 inches and legally disposed of. Actual removal depth may vary and will be determined at time of construction.

C. Over excavate the in-situ soils as required to allow the minimum amount of select structural fill to be placed beneath the slab to achieve the desired elevation. See Construction Documents for amount of select structural fill required per soils report.

D. After stripping, and excavating to the desired grade as indicated above, the exposed soil shall be proof-rolled to locate all soft or loose areas. Soils, which are observed to rut or deflect excessively under the moving load, shall be undercut and replaced with properly compacted structural fill. The proof-rolling and undercutting activities shall be witnessed by a representative of the geotechnical engineer and shall be performed during a period of dry weather.

E. Subsequent to proof-rolling, and just prior to placement of fill, the exposed subgrade within the construction areas shall be evaluated for moisture and density. The subgrade soils shall be at or above the optimum moisture content, and have an in-place dry density of at least 95 percent of the standard effort (ASTM D698) maximum dry density of the in-situ soils. If the moisture or density does not meet the above criteria, the subgrade shall be scarified to a minimum depth of 6 inches, and moisture adjusted to meet the requirements per the soils report as indicated on the Construction Documents.

F. If remediation is required, Contractor shall have any of the following remediation options:
   1. Disking and drying with natural means (if the construction schedule allows).
   2. Dry the surface soils by chemically treatment.
   3. Remove the unsuitably wet soils and replace the wet soil with select fill having an acceptable moisture content.

   The option will be entirely up to the Contractor and no extra will be paid by the Owner.

G. After proof-rolling and undercutting has been completed, and the subgrade tested and adjusted as necessary, fill placement may begin. The first layer of fill shall be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped subgrade soils.

H. Refer to construction drawings for information regarding lime-stablized subgrade treatment.

3.3 FILL PLACEMENT

A. Structural fill materials shall be as specified in Paragraph 2.1, A above. Structural fill shall be placed in maximum lifts of eight (8) inches of loose material and shall have a moisture content as indicated on the Construction Documents. If water must be added, it shall be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of structural fill shall be tested by a representative of the geotechnical engineer prior to placement of subsequent lifts.

B. Each lift of structural fill shall be compacted as required per the soils report and as indicated on the Construction Documents. Care shall be taken to apply compactive effort throughout the fill and fill scope areas. The moisture content and the degree of compaction of the structural fill soils shall be maintained until the construction of structures above them.

C. Contractor shall be responsible for damage caused to structure because of over excavation or excavations left open during inclement weather. Should the subgrade, for any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.4 GRADING

A. Rough Grading: Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas or damaging other structures. Furnish pumping required to keep excavated spaces clear of water during construction. If a foundation excavation must remain empty through a shut-down period, cover with boards and building paper and clean out immediately when work resumes. If any subgrade should be damaged due to flooding, damaged area shall be removed and filled with select fill.

B. Finish Grading:
1. After rough grading is completed, provide and place previously stripped material or imported top soil in the amounts required to bring the rough grade to within two (2) inches of finish grade. This earth fill shall be placed in lifts not to exceed 12 inches after compaction and shall be compacted to a dry density of at least 95 percent of the ASTM D698 maximum dry density.
2. Assure bonding of layers of fill material in compliance with the specifications.
3. Final and fine grading shall be done using a tractor pulled landscape rake and hand raking removing all debris immediately prior to landscaping. The final

graded ground surface shall be relatively smooth, free of organic material and in suitable condition to commence landscaping work.

C. Topsoil:
1. Contractor shall furnish all topsoil that may be required to provide finish elevations. Topsoil material shall meet requirements of Paragraph 2.1 of this Section. Spread minimum two (2) inches of topsoil over graded areas after rough grading has been completed.
2. At the completion of finish grading, ground surface shall be relatively smooth, free of organic material and in suitable condition to commence landscaping work.

3.5 INSPECTION AND TESTING LABORATORY SERVICES

A. Refer to Section 01 45 23, Inspection and Testing Laboratory Services for laboratory services to determine the liquid limit, plastic limit and plasticity index for soils and in-place density tests for compacted material.

B. The Contractor shall cooperate with the inspection and testing laboratory in all matters pertaining to the work.

END OF SECTION 31 00 00

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the requirements for Site clearing which may consist of:

1. Protection of trees indicated to be preserved.

2. Protection of above-ground and below-ground existing improvements indicated to be preserved.

3. Clearing, grubbing, removal and disposal of trees, stumps, brush, roots, vegetation, logs and rubbish.

4. Removal and disposal of above-ground and below-ground materials and existing improvements, including building demolition if any, as indicated.

5. Stripping and stockpiling of topsoil.

6. Stripping and stockpiling natural leaf mulch.

1.2 SUBMITTALS

A. In accordance with Section 00 72 00 – Uniform General Conditions, Sub-Section UGC 8.3 for Waller Independent School District (WISD) projects.

1.3 JOB CONDITIONS

A. Conduct demolition operations and removal of debris in accordance with governing regulations and Section 024117 - Demolition of these Specifications.

B. Ensure minimum interference with adjacent occupied or used facilities.

C. Exercise care to protect adjacent building, structures, and persons.

D. Above-ground and below-ground existing improvements, indicated to remain, shall be protected from damage prior to and during construction operations.

E. Tree Protection

1. Trees to be preserved shall be protected by barricades to avoid any confusion and damage prior to site clearing operations.

2. Contractor shall install barricades 3 ft. beyond drip line of trees to be protected.

Construction equipment or storage activities shall not be permitted within the fenced area.

F. Protection of Existing Utilities and Adjacent Work

1. Prior to earthwork operations, existing utilities, facilities and permanent objects to remain shall be located and adequately protected. When working near public and private utility company lines, Contractor shall contact the local utility coordinating committee, or the utility company involved to locate their lines.

2. If unknown and uncharted utilities are encountered during excavation, promptly notify Owner and the governing utility company when determinable and wait for instructions.

3. If it is determined by Owner that such utility line has been abandoned, properly cap line at a depth approved by Owner or remove line as directed.

4. If such unknown utilities are encountered and work is continued without contacting the Owner for instructions, and the encountered utilities are damaged by continuation of the work, Contractor shall repair, at this own expense, such damage to the satisfaction of the Owner and the Utility Company. The Contractor shall be responsible for all costs to repair the damage.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CLEARING

A. Trees to be removed, stumps, brush, roots and vegetation shall be removed to a depth of not less than 2 feet below original or finish ground level, whichever is lower.

B. Miscellaneous vegetation, logs and rubbish shall be removed in their entirety, within the limits of improvements.

C. Topsoil shall be stripped to underlying subsoil. Topsoil shall be defined as friable organic clay loam surface soil, reasonably free of clay lumps, stones, weeds, roots and other objectionable material. Topsoil shall be safely stockpiled on the Site. Stockpiles shall be constructed to freely drain surface water.

D. Depressions caused by clearing, grubbing and stripping operations shall be filled with approved backfill material, unless further excavation is required by the construction operations. Backfill shall be placed in accordance with Section 312300 – Excavation, Grading, and Fill of these Specifications.

3.2 REMOVAL OF IMPROVEMENTS

A. Above-ground and below-ground existing improvements shall be removed in their entirety, except for utilities which shall be removed only to the extent indicated. Where utilities are indicated to be removed in part, the ends of the remaining utilities shall be permanently plugged with Class 3000 concrete.

3.3 DISPOSAL OF MATERIALS

A. Materials not scheduled to be salvaged shall become the property of the Contractor and shall be removed from the Site and legally disposed of. Burning or burying cleared, grubbed and demolition waste materials on the Site shall not be permitted.

B. Remove items, without damaging, scheduled to be salvaged as directed by the engineer and placed in designated storage area.

END OF SECTION 31 11 00

SECTION 31 23 00
GRADING EXCAVATION AND FILL

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. PROTECTION OF TREES.

B. FIELD ENGINEERING FOR SITE LAYOUT.

C. TESTING LABORATORY SERVICES.

D. FILL MATERIAL FOR PAVEMENT SUBBASE.

E. CONCRETE REINFORCING.

F. CAST-IN-PLACE CONCRETE.

G. INFORMATIONAL REFERENCE TO SITE SURVEY AND TO SUBSURFACE CONDITIONS.

1.2 QUALITY ASSURANCE

A. REFERENCE STANDARDS:

1. ASTM D 698, TEST FOR MOISTURE-DENSITY RELATIONS OF SOILS (STANDARD PROCTOR).

2. ASTM D 2922, TEST FOR DENSITY OF SOIL IN PLACE BY NUCLEAR METHOD.

3. ASTM D 2487, CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES.

1.3 SUBMITTALS

A. SAMPLES:

1. SUBMIT 10 POUND SAMPLE QUANTITY OF FILL MATERIALS.

2. SUBMIT 20 POUND SAMPLE QUANTITY OF TOPSOIL MATERIAL.

3. PACK TIGHTLY IN CONTAINERS TO PREVENT CONTAMINATION.

1.4 GRADES

A. CAREFULLY COMPARE NEW GRADE REQUIREMENTS WITH EXISTING

CONDITIONS.

B. PROVIDE NECESSARY EARTH, GRADING AND SHAPING WORK.

C. EXTRA PAYMENT WILL NOT BE AUTHORIZED FOR OVERAGE OR SHORTAGE OF MATERIAL.

PART 2 – PRODUCTS

2.1 MATERIALS

A. SUB BASE MATERIAL: UNWASHED PIT RUN OR CRUSHED GRAVEL, CRUSHED STONE, OR CRUSHED SLAG, NATURALLY OR ARTIFICIALLY GRADED WITH MAXIMUM AGGREGATE SIZE OF 1-1/2 INCHES, AS ACCEPTABLE TO TESTING LABORATORY.

B. BACKFILL AND FILL MATERIAL: SOIL MATERIALS FREE OF DEBRIS, WASTE, FROZEN MATTER, VEGETABLE AND OTHER DELETERIOUS MATTER, AS ACCEPTABLE TO TESTING LABORATORY.

C. SELECT FILL: IMPORTED LEAN CLAY WITH A NARROW PLASTICITY INDEX (PI) RANGE OF 10 TO 15.

D. LIME TREATED STRUCTURAL FILL: ON-SITE CLAY MIXTURE, FREE OF SILT, LOAM, FRIABLE OR SOLUBLE MATERIALS AND ORGANIC MATTER; TREATED IN 6 INCH LIFTS WITH 36 POUNDS PER SQUARE YARD OF HYDRATED LIME.

E. BACKFILL:

1. FREE FROM ROCKS LARGER THAN 3 INCHES IN SIZE, ALKALI, SALT, PETROLEUM PRODUCTS, DEBRIS, WASTE, ROOTS, VEGETABLE AND OTHER DELETERIOUS MATTER.

2. EXCESS NON-VEGETATED EXCAVATED SOILS AVAILABLE FROM SITE MAY BE USED IF CONFORMING TO SPECIFIED REQUIREMENTS.

F. LIME: MATERIAL CONFORMING TO SDHPT ITEM 264, "HYDRATED LIME AND LIME SLURRY".

G. SOIL FILTER FABRIC: MIRAFI "1405" IS SPECIFIED; DUPONT "TYPAR" IS ACCEPTABLE, OR APPROVED EQUAL.

PART 3 EXECUTION

3.1 OBSTRUCTIONS

A. REMOVE OBSTRUCTIONS WITHIN LINES OF IMPROVEMENTS.

B. REFER OBSTRUCTIONS OF QUESTIONABLE NATURE TO ENGINEER.

C. REMOVE ABANDONED FOUNDATIONS DOWN TO 12 INCHES BELOW FINISHED GRADE, OR THE FINISHED ELEVATION OF PAVEMENTS AND WALKS UNLESS INDICATED OTHERWISE ON THE DRAWINGS.

D. REMOVE FOUNDATIONS OF LIGHT STANDARDS COMPLETELY.

3.2 STRIPPING

A. STRIP ENTIRE AREA TO RECEIVE PAVEMENT AND SLABS ON GRADE TO A MINIMUM DEPTH OF SIX INCHES TO REMOVE SOIL CONTAINING VEGETATED MATERIAL.

B. REMOVE VEGETATED MATERIAL FROM SITE AS WASTE.

C. REMOVE TOPSOIL; SPREAD ON AREAS ALREADY GRADED AND PREPARED FOR TOPSOIL, OR DEPOSIT IN STORAGE PILES CONVENIENT TO AREAS SUBSEQUENTLY TO RECEIVE TOPSOIL.

D. SCARIFY EXISTING ASPHALT SURFACING AND FLEXIBLE BASE COURSE MATERIAL AND REMOVE FROM SITE.

E. REMOVE EXISTING SITE IMPROVEMENTS IN AREAS SCHEDULED TO RECEIVE LAWNS, BUILDINGS, AND PAVEMENTS.

F. STRIPPED MATERIAL BECOMES PROPERTY OF CONTRACTOR; REMOVE FROM PROJECT SITE IMMEDIATELY AND DISPOSE OF PROPERLY.

G. MAINTAIN SITE SURFACE DRAINAGE DURING CONSTRUCTION.

3.3 EXCAVATION AND COMPACTION BELOW GRADE BEAMS AND SLABS-ON-GRADE

A. EXCAVATE SUB GRADE FOR THE BUILDING FOOTPRINT TO ALLOW A MINIMUM OF 4 FEET OF THICKNESS BELOW THE BOTTOM OF THE SLABS-ON-GRADE .IN ACCORDANCE WITH LINES AND GRADES REQUIRED FOR CONSTRUCTION OF THE WORK, INCLUDING SPACE FOR PLACING AND REMOVAL OF FORMS, BRACING AND SHORING, FOR INSPECTION AND A MINIMUM OF 5 FEET BEYOND THE BUILDING LINE.

B. MAINTAIN EXCAVATIONS FREE OF LOOSE EARTH, DEBRIS, AND KEEP DRY UNTIL PLACEMENT OF CONCRETE.

C. PROOF ROLL THE SOIL AT THE BASE OF THE EXCAVATION USING A RUBBER-TIRED VEHICLE WEIGHING ABOUT
20 TONS, SUCH AS A LOADED DUMP OR WATER TRUCK.

D. REMOVE AND REPLACE ANY SOFT OR WEAK SOILS IDENTIFIED. DISKING, DRYING AND RECOMPACTION DURING DRY WEATHER OR TREATMENT WITH A CHEMICAL ADDITIVE MAY BE USED AS NEEDED AS REMEDIAL OPTIONS.

E. PLACE A MINIMUM 3 FEET THICKNESS STRUCTURAL FILL AND SELECT AS RECOMMENDED BY THE SOILS REPORT, FILL AS INDICATED, IN CONSECUTIVE 8 INCH MAXIMUM LOOSE LIFTS. COMPACT ANY LIME TREATED CLAY AND SELECT FILL TO AT LEAST 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DENSITY ACCORDING TO ASTM D 698.

F. IF HIGH MOISTURE CONTENT IS DETERMINED BY ASTM D698, COMPARE THE IN-PLACE DENSITY OF LIME- TREATED CLAYS WITH 90 PERCENT OF THE MAXIMUM DENSITY DETERMINED BY MODIFIED EFFORT ACCORDING TO ASTM D 1557, IF REQUIRED. THE ACTUAL RANGE OF MOISTURE WITHIN WHICH SPECIFIED COMPACTION CAN BE ACHIEVED MAY BE ADJUSTED ONCE THE MOISTURE-DENSITY RELATIONSHIP FOR THE STRUCTURAL FILL HAS BEEN DEVELOPED.

G. PROTECT OPEN EXCAVATIONS WITH COVERINGS AS NECESSARY TO MAINTAIN EXISTING SOIL MOISTURE CONTENT.

3.4 EXCAVATION FOR UTILITY TRENCHES

A. EXCAVATE USING LADDER-TYPE TRENCHING MACHINE OR BACKHOE UNLESS INDICATED OTHERWISE.

B. CUT TRENCH SIDES VERTICAL FROM TRENCH BOTTOM TO ONE FOOT ABOVE TOP OF PIPE; SLOPE BACK ON STABLE SLOPE ABOVE THAT POINT.

C. EXTEND TRENCH WIDTH MINIMUM 6 INCHES AND MAXIMUM 18 INCHES EACH SIDE OF PIPE.

D. EXCAVATE TRENCH TO A MINIMUM DEPTH OF 4 INCHES BELOW BOTTOM ELEVATION OF PROPOSED PIPELINES.

E. LEAVE NO MORE THAN 500 FEET OF TRENCH OPEN AT ONE TIME.

F. WHERE AUGURED HOLE IS INDICATED, PROVIDE OPENING NO LARGER THAN ONE INCH GREATER THAN OUTSIDE DIAMETER OF PIPE BELL.

3.5 DEWATERING

A. KEEP EXCAVATIONS DRY; MAINTAIN DEWATERED CONDITION FOR DEPTH OF ONE FOOT BELOW EXCAVATION BOTTOM.

B. OPERATE SUITABLE PUMPS NECESSARY TO KEEP EXCAVATIONS CONTINUOUSLY FREE OF WATER.

C. DISCHARGE DRAINAGE WATERLINES INTO APPROVED SEWERS ONLY WITH APPROPRIATE APPROVALS; USE OF SANITARY SEWER IS PROHIBITED.

D. DIRECT SURFACE DRAINAGE AWAY FROM EXCAVATED AREAS.

E. CONTROL GRADING ADJACENT TO EXCAVATIONS TO PREVENT WATER RUNNING INTO EXCAVATED AREAS.

3.6 PERIMETER BACKFILL

A. BACKFILL EXTERIOR SIDE OF PERIMETER OF STRUCTURE WITH LIME-TREATED ON-SITE CLAY MATERIALS, CARRYING SUCH FILL UP TO INDICATED SUB GRADES.

B. BACKFILL SYSTEMATICALLY AND AS EARLY AS POSSIBLE TO ALLOW MAXIMUM TIME FOR NATURAL SETTLEMENT AND COMPACTION.

C. COMMENCE BACKFILLING AFTER UNDERGROUND WORK HAS BEEN INSPECTED, TESTED, FORMS REMOVED, AND EXCAVATION CLEANED OF TRASH AND DEBRIS.

D. PLACE AND COMPACT BACKFILL TO MINIMIZE SETTLEMENT AND AVOID DAMAGE TO WORK IN PLACE.

E. PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES OF FREESTANDING STRUCTURES; PREVENT WEDGING ACTION AGAINST STRUCTURE.

F. PLACE MATERIALS IN SUCCESSIVE HORIZONTAL LAYERS OF NOT MORE THAN 8 INCHES (4 INCHES FOR HAND- HELD TAMPING EQUIPMENT) AND UNIFORMLY COMPACTED TO 92% OF MAXIMUM DENSITY AS CONFIRMED BY TESTING LABORATORY.

3.7 UTILITY TRENCH BACKFILL

A. PIPE BEDDING AND BACKFILL REQUIREMENTS FOR SANITARY SEWERS SHALL BE AS SPECIFIED IN SECTION 333100, SANITARY SEWAGE SYSTEMS.

B. PIPE BEDDING AND BACKFILL REQUIREMENTS FOR STORM SEWERS SHALL BE

AS SPECIFIED IN SECTION 334100, STORM SEWAGE SYSTEMS.

C. PIPE BEDDING AND BACKFILL FOR WATER DISTRIBUTION SYSTEM PIPING SHALL BE IN ACCORDANCE WITH CITY OF BEAUMONT "SPECIFICATIONS FOR WATER MAIN CONSTRUCTION AND MATERIALS" AND "SPECIFICATIONS FOR WATER TAPS AND SERVICE LINES", 3/4-INCH THROUGH 2-INCH, WITH LATEST ADDENDA AND AMENDMENTS THERETO.

D. BACKFILL TRENCH AS SOON AS POSSIBLE AFTER PIPE HAS BEEN LAID, JOINTED, AND INSPECTED; COMPLETE BACKFILLING AT END OF EACH DAY.

E. WITHIN PIPE ZONE: PLACE BACKFILL MATERIAL AND HAND TAMP IN 6 INCH LAYERS TO ONE FOOT ABOVE TOP OF PIPE.

F. USE OF BULLDOZER OR SIMILAR TRACKED EQUIPMENT IS UNACCEPTABLE FOR COMPACTION.

3.8 PREPARATION OF SUBGRADE FOR PAVING, WALKS AND EXTERIOR SLABS

A. CUT AND FILL AREAS AS REQUIRED.

B. PROOF ROLL SUB GRADE WITH HEAVY ROLLER. CUT OUT ANY SOFT AREA THAT CANNOT BE COMPACTED BY SURFACE ROLLING AND REPLACE WITH COMPACTED SELECT FILL.

C. PROVIDE SELECT FILL AT AREAS WHERE REQUIRED TO ELEVATE SUB GRADE. LIME STABILIZATION: STABILIZE TO DEPTH OF 8 INCHES WITH LIME SLURRY IN ACCORDANCE WITH TXDOT ITEM 260. **SUBGRADE BENEATH SIDEWALKS SHALL NOT BE LIME STABILIZED.**

D. COMPACT TO NOT LESS THAN 85 TO 92% OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698 AS CONFIRMED BY TESTING LABORATORY; WITH MOISTURE CONTENT FOR COMPACTED MATERIAL WITHIN +/- 2% OF OPTIMUM MOISTURE.

E. MAINTAIN SITE SURFACE DRAINAGE DURING CONSTRUCTION.

3.9 ROUGH GRADING

A. SHAPE SUB GRADE TO ALLOW FOR MAXIMUM AMOUNT OF NATURAL SETTLEMENT AND COMPACTION.

B. REMOVE DEBRIS, ROOTS, BRANCHES, STONES, IN EXCESS OF 2 INCHES IN SIZE.

C. REMOVE SUBSOIL WHICH HAS BEEN CONTAMINATED WITH PETROLEUM PRODUCTS.

D. EXCAVATE AREAS, TO SUB GRADE ELEVATION, WHICH ARE TO RECEIVE PAVING AND SIDEWALKS.

E. BRING SUB GRADE TO REQUIRED LEVELS, PROFILES AND CONTOURS, MAKING GRADUAL CHANGES IN GRADE; BLEND SLOPES INTO LEVEL AREAS.

F. SLOPE GRADE AWAY FROM BUILDING MINIMUM 2 INCHES IN 10 FEET UNLESS INDICATED OTHERWISE.

G. CULTIVATE SUB GRADE TO A DEPTH OF 3 INCHES WHERE TOPSOIL IS TO BE PLACED; REPEAT CULTIVATION IN AREAS WHERE EQUIPMENT USED FOR HAULING AND SPREADING TOPSOIL HAS COMPACTED SUB GRADE.

H. MAINTAIN SITE SURFACE DRAINAGE DURING CONSTRUCTION.

3.10 SURPLUS MATERIALS

A. REMOVE SURPLUS SUBSOIL FROM SITE.

B. LEAVE STOCKPILE AREAS AND ENTIRE JOB SITE CLEAN AND RAKED, READY TO RECEIVE LANDSCAPING.

3.11 CLEAN-UP

A. REMOVE TEMPORARY STRUCTURES, RUBBISH, AND WASTE MATERIALS FROM WORK SITE DAILY.

END OF SECTION 31 23 00

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This Section pertains to the provisions for the control of erosion in the construction area and in stockpile areas including seeding, the construction of temporary swales and sedimentation basins as required and shown on the drawings. All areas where existing vegetation and grass cover have been bared by construction activities shall be protected from erosion.

B. Contractor is responsible for meeting all local, state and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System, Phase II, regulations from the Clean Water Act.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and general provisions of the Contract, including A-Procurement and Contracting Requirements, Division 00 and Division 01 apply to this section.

B. Section 31 11 00 Clearing and Grubbing

C. Section 31 23 00 Grading Excavation and Fill

D. Section 33 05 28 Trenching and Backfill for Utilities

E. Section 33 40 00 Drainage

F. Texas Department of Transportation’s Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014)

1.3 PERMITS (NOT USED)

1.4 APPLICABLE PUBLICATIONS (NOT USED)

1.5 PROTECTION OF ADJACENT WORK (NOT USED)

1.6 DEFINITIONS

A. Best Management Practices (BMP's) means physical facilities schedules of activities, prohibition of practices, maintenance procedures, and other management practices , when properly designed, installed, and maintained, will be effective to prevent or reduce the discharge of pollution associated with construction activities. BMP's also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

B. Block Sodding: Sodding for erosion control and for final stabilization shall consist of

providing and planting Bermuda grass, San Augustine grass, or other acceptable sod along or across such areas as are designated on the drawings and in accordance with the specification requirements herein outlined.

C. Hydromulch Seeding: Seeding, followed by the application of a mulch erosion control blanket shall consist of preparing the ground, sowing of seeds, application of a fertilizer, and stabilization with mulch consisting of a biodegradable fiber along and across such areas as are designated on the plans and in accordance with these specifications

D. Silt Fence: The reinforced filter fabric barrier consists of geotextile fabric supported by a net reinforced fence stretched across and attached to supporting posts or frame and entrenched. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.

E. Inlet Protection Barriers: The inlet protection barrier consists of a geotextile fabric (filter fabric) supported by a net reinforced fence structure and constructed around a storm drain inlet, catch basin, or culvert. An alternative design of the inlet protection barrier, as approved by the Engineer, consists of fiber rolls placed around a frame, staked in place (or weighted down with clean gravel bags), and constructed around a storm drain inlet, catch basin or culvert. This work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation. As designated on the plans and in accordance with these specifications.

F. Sediment Basins: A sediment basin is a temporary basin or dam constructed across a waterway or excavated location to intercept sediment-laden runoff and to trap and retain the sediment. A sediment basin is usually installed at points of discharge from drainage areas greater than 5 acres. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.

G. Stabilized Construction Access: This work shall consist of the installation of temporary erosion protection and sediment control stabilized construction access - type I, rock, utilized during construction operations and prior to final stabilization, in accordance with these specifications and construction drawings

H. Rock Filter Dams: Rock filter dams are temporary berms constructed of stone to intercept and slow storm water runoff to retain sediment on the construction site.

1. Depending upon the type of rock filter dam specified in the construction plans as Type 1, 2, 3, or 4, the aggregate fill may be unwrapped, wrapped in twisted hexagonal wire mesh, or confined in a gabion wire basket. Applications of RockFilter Dams are as follows:

a. Type 1 dams may be used at toe of slopes, around inlets, in small ditches, and at dike or swale outlets. Type 1 dams are recommended for erosion and sediment control from a drainage area of 5 acres or less.

b. Type 2 dams may be used in ditches and at dike or swale outlets.

c. Type 3 dams may be used in stream fl

d. Type 4 sack gabions may be used in ditches and smaller channels to form an erosion and sediment control dam

1.7 QUALITY ASSURANCE

A. Codes and Standards: Install and maintain erosion control systems in compliance with all authorities having jurisdiction.

1.8 PROJECT/SITE CONDITIONS (NOT USED)

1.9 SUBMITTALS (NOT USED)

PART 2 – PRODUCTS

2.1 SUSTAINABLE MATERIALS

A. Contractor shall strive to utilize sustainable materials, which include rapidly renewable materials, regional materials, regionally manufactured materials, regionally extracted materials, recycled contents.

2.2 GRASS

A. Materials for erosion control seeding shall conform to TxDOT Item 164.

B. Materials for erosion control sodding shall conform to TxDOT Item 162.

2.3 FERTILIZER

A. Materials for fertilizing erosion control seeding and/or sodding shall conform to TxDOT Item 166.2

2.4 WATER

A. Use clean potable water for maintaining the grass developed after erosion control seeding and/or sodding. Water shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.

B. Water sources other than the local municipal domestic water supply must be approved by the Owner.

C. If onsite reclaimed water sources are used, tanks and apprentices must be clearly marked with the words “non-potable” water.

2.5 SILT FENCE

A. Geotextile fabric for Silt Fences must meet the TxDOT Departmental Material Specifications DMS 6230 Temporary Sediment Control Fence Fabric.

2.6 STRAW BALES

A. Standard rectangular hay bales bound by baling wire, clean and dry

2.7 INLET PROTECTION BARRIERS

A. Geotextile per 2.5 Silt Fence above.

B. Hardwood Posts shall be 2x2 minimum length 4 feet.

C. Net reinforced fence shall be 2 inch by 4 inch welded wire fabric mesh. The mesh support height shall be the equivalent height, or greater, of the geotextile fabric to be attached.

2.8 STABILIZED CONSTRUCTION ACCESS

A. Materials to be per TxDOT spec section 506.2.E.1 for Type 1

2.9 ROCK FILTER DAM

A. Materials. Geotextile fabric shall consist of a woven monofilament or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Geotextile fabric shall equal or exceed the following average roll values or as directed by the Engineer:

1. Minimum average roll value.

a. Elongation – 50 percent.

b. Grab Strength – 200 pounds.

c. Puncture Strength – 75 pounds.

d. UV Stability (retained strength) – 50 percent after 500 hours of exposure.

2. Maximum average roll value.

a. Apparent Opening Size (AOS) – 0.6 mm/#30 US sieve.

B. Geotextile fabric shall be resistant to commonly encountered soil chemicals, mildew, rot, insects, and deterioration resulting from exposure to sunlight or heat. Geotextile fabric shall provide an expected useable life comparable to the anticipated construction period.

C. Aggregate for the rock filter dams shall consist of crushed stone. Aggregate particles shall be composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials or organic and injurious matter. Aggregate shall be cubic or rounded form, not elongated, flat, shapes. Spalls, fragments, and chips shall not exceed 5 percent by weight. Crushed concrete shall not be substituted for the crushed stone unless as approved by the Engineer. Aggregate size shall depend upon the type of rock filter dam specified in the construction plans. Aggregate size based on type of rock filter dam is as follows:

1. Type 1: 3 inches to 5 inches, open-graded.

2. Type 2: 3 inches to 5 inches, open-graded.

3. Type 3: 4 inches to 8 inches, open-graded.

4. Type 4: 3 inches to 5 inches, open-graded.

D. Mesh is required for reinforced type rock filter dams. Mesh shall be 20 gauge galvanized double twisted hexagonal wire mesh with 1-inch diameter hexagonal openings. Mesh wire shall be zinc coated prior to being double twisted. Reinforcing spiral binders, lacing wire, and stiffeners shall be made of wire having the same coating material and same wire size as the wire mesh. Gabion wire baskets shall equal or exceed the requirements of the wire mesh.

PART 3 – EXECUTION

3.1 GENERAL

A. Protection

1. Protect benchmarks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs, and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement. If damaged or displaced, notify Engineer and correct defects as directed.

2. Protect above and below grade utilities which are to remain.

B. Preparation:

1. Use all means necessary to control dust on and near the work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the work of this Section, or if resulting from the condition in which Project Site is left by Contractor.

2. Moisten surfaces, as required, to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on Project Site.

C. Install erosion control systems at the site's boundary at locations where stormwater runoff will leave the site prior to starting any clearing, stripping, or earthwork operations

D. Minimize the time areas are to be exposed without vegetative cover.

E. Properly dispose of solid waste, paints, solvents, cleaning compounds, etc.

F. Store construction materials in designated areas away from drainageways and low areas.

G. Provide portable toilets and properly dispose of sanitary sewage.

H. Construct containment berms and utilize drip pans at fuel and liquid storage tanks and containers.

3.2 INSTALLATION OF EROSION CONTROL DEVICES

A. Install erosion control devices to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the work of this Contract.

1. Implement erosion control measures indicated on drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.

B. Install silt fence located along perimeter of site or grading limits immediately following site clearing operations specified under Division 31 Section 31 11 00 Clearing and Grubbing.

1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.

a. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.

2. Drive support post into ground not less than 18 inches.

3. Excavate a 4-inch-wide by 4-inch-deep trench on up-slope side of silt fence.

a. Line trench with silt fence fabric material.

b. Backfill trench with soil or gravel.

C. Install straw bale fence at completion of grading operations in affected area as indicated on drawings.

1. Install erosion control devices at storm sewer inlets immediately after completion of the storm sewer.

2. Place straw bales in a single row, lengthwise on the contour, and embedded 4 inches into soil.

3. Secure each individual bale in place by stakes or reinforcement bars driven through bales into the ground to a depth of not less than 18 inches.

D. Install inlet protection barriers at curb inlets and at area inlets.

E. Install straw bale fences as ditch checks in drainage ditches.

F. Install Stabilized Construction Access per TxDOT specification 506.4.C.5.

G. Rock filter dams shall be installed so as to prevent downstream deposition of sediment and debris from the construction site. Rock filter dams shall be constructed to meet the following criteria:

1. Type 1:
    a. Non-reinforced.
    b. Height: 18-24 inches
    c. Top width: 2 feet minimum.
    d. Upstream and downstream side slope of dam: 2:1 maximum.
    e. Open graded aggregate 3-5 inches.
2. Type 2:
    a. Reinforced with wire mesh.
    b. Height: 18-36 inches.
    c. Top width: 2 feet minimum.
    d. Upstream and downstream side slope of dam: 2:1 maximum.
    e. Open graded aggregate 3-5 inches.
3. Type 3:
    a. Reinforced with wire mesh.
    b. Height: 36-48 inches.
    c. Top width: 2 feet minimum.
    d. Upstream and downstream side slope of dam: 3:1 maximum.
    e. Open graded aggregate 4-8 inches.
4. Type 4:
    a. Reinforced in a gabion wire basket.
    b. Height: 30 inches minimum.
    c. Top width: 2 feet minimum.
    d. Upstream and downstream side slopes of dam: none specified.
    e. Open graded aggregate 3-5 inches.
5. The separation geotextile fabric and wire mesh shall be sized and placed in

accordance with the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The separation geotextile fabric may be omitted only as approved by the Engineer. The separation geotextile fabric and wire mesh shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel prior to aggregate placement. Sack gabions for Type 4 rock filter dams shall be securely staked with wooden or metal stakes to the bottom and side slopes of the ditch or channel, as well.

6. Aggregate fill shall be placed to the width, length, height and slopes in accordance with this specification and the rock filter dam detail and as specified by the type of rock filter dam shown in the construction plans. The height of the dam shall be measured vertically from the existing ground to the top of the filter dam. The length of the dam shall be measured across the top centerline of the dam from embankment to embankment and includes the additional length embedded into the embankment. Width of the dam shall be measured along the top face of the dam.

7. Wire mesh shall be folded upstream side over the aggregate fill and tightly secured to itself on the downstream side using wire tires. Hog rings may be substituted for wire ties.

8. Additional aggregate fill or gravel bags shall be placed and secured at the embedded section to prevent low flows from short circuiting the dam at the adjacent dirt embankment area.

9. The Contractor shall be responsible for periodic reshaping, repairing, and maintaining of rock filter dams as directed by the Engineer.

10. The Contractor is responsible for removal and proper disposal of sediment and debris from the rock filter dam. Removed sediment and debris shall not be allowed to flush into the storm sewer system, waterways, jurisdictional wetlands, or onto adjacent properties. Sediment deposits shall be removed before they reach one-third of the height of the dam. Uncontaminated sediment can be placed at the project spoil site or, if properly handled, spread out to supplement fill requirements. If sediment has been contaminated, then it shall be disposed of in accordance with the applicable federal, state, and local regulations. Offsite disposal shall be the responsibility of the Contractor. Contractor is encouraged to reuse aggregate and wire mesh if remaining materials meet original spec requirements.

3.3 EROSION CONTROL SEEDING

A. Exposed fill and stockpile areas shall be protected from windborne erosion if the phasing of the construction operations is anticipated to leave the exposed fill and stockpile areas unattended for 6 weeks or more. At completion of stockpiling operations, stockpiles shall be shaped and graded to drain. Provide a layer of mulch to all sides of the stockpile to protect the stockpile from windborne erosion.

B. Areas designated on the drawings to be seeded shall be seeded in accordance to the Texas Department of Transportation Standard Specifications, Item 164, titled "Seeding for Erosion Control". Broadcast seeding method shall be used as described in TxDOT, Item 164.4 unless otherwise instructed.

C. Areas to be seeded with slopes steeper than 10H:1V shall also utilize a soil retention

blanket as specified in TxDOT Item 169 Soil Retention Blanket.

3.4 TEMPORARY SWALES

A. Temporary drainage swales shall be provided as required to carry drainage away from the work area to an approved outfall point.

B. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least two (2) feet deep with a slope of 0.1%.

C. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.

D. Swales shall have erosion control barriers as required in these specifications.

3.5 FILL AND CUT SLOPES

A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's Geotechnical engineer.

B. When cut slopes exceed 2:1 for depths over three (3) feet, proper bracing and shoring per OSHA requirements shall be used and maintained.

C. For permanent slopes, cut or fill, between 2:1 and 10:1, erosion protection shall be provided with hydromulching seeding, sodding, or other method as approved.

D. Where cut slopes of more than 5 feet deep, extend more than 100 feet in length, contractor shall provide a backfill drain at the top of the slope to ease in drainage and erosion control.

3.6 SEDIMENTATION BASINS

A. Sedimentation ponds shall be provided when designated on the plans.

B. All drainage from cleared areas shall be routed through the sedimentation basin.

C. Contractor will be responsible for the operation and maintenance of the pond during construction.

3.7 MAINTENANCE

A. Check all erosion control measures after each rainfall event to ensure that they are in proper working order.

1. Immediately restore all measures to installed condition.

2. During the course of construction all temporary swales constructed for this contract shall be maintained so as to allow proper drainage from the construction area. Before Contractor leaves the site at the end of construction, all temporary swales must be reworked to meet final conditions as set forth in the drawings and specifications.

3. The Contractor shall assure that all subwork with other contractors at the site understand the importance of the erosion control features. The Contractor shall require all subcontractors to respect the function of the erosion control features and enlist their coordination in maintaining existing swales and ditches.

B. Inspect silt and straw bale fences at least once a week.

1. Immediately replace damaged portions of the silt fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.

2. Remove sediment deposits, as necessary, to provide adequate sediment storage and to maintain the integrity of fences. Dispose of accumulated sediment by spreading over upland areas of the site.

C. Maintain erosion control devices in place, as specified, until completion of the work of this Contract.

1. At completion of work, inspect all systems, make necessary repairs, remove and dispose of all accumulated sediment, and turn completely operable systems over to Owner for continued maintenance.

D. Where necessary for equipment and vehicular access to the work areas, adequately sized culverts shall be installed and maintained to provide the access without disturbing the site drainage.

E. Sedimentation Basins.

1. Contractor shall be responsible for maintaining the pond and the outfall and sediment retarding structure in good working condition throughout the time the pond is to be in operation.

2. When sediment and debris fill the pond to over one third (1/3) its designed capacity, the pond shall be cleaned out.

3. The sediment from the clearing operation shall be stockpiled with like materials per Specification 31 11 00 Clearing and Grubbing. If the material is found to not meet the stockpiling requirements listed in 31 11 00, they must be removed from the site as described in 31 11 00.

3.8 INSPECTIONS

A. Inspect all erosion control systems and devices at least once every seven calendar days.

B. Inspect all erosion control systems and devices within 24 hours of the end of any storm which results in precipitation of 1/2 inch or more.

C. During inspections, locations where stormwater leaves the site shall be inspected for evidence of erosion or sediment deposition.

D. Correct deficiencies within three calendar days.

E. Complete a report of each inspection. Report shall contain the following minimum information:

1. Inspector's name

2. Inspection date

3. Observations of the effectiveness of erosion control systems

4. Actions taken if necessary to correct deficiencies

5. Listing of areas where construction operations have permanently or temporarily stopped

6. Authorized signature

END OF SECTION 31 25 00

SECTION 31 63 29
DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Dry-installed drilled piers.
   2. Slurry displacement-installed drilled piers.
   3. Dry-installed or slurry displacement-installed drilled piers at Contractor's choice.

1.3 UNIT PRICES

A. Unit prices are included in Section 01 22 00 "Unit Prices."

B. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts and bells.
   1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.
   2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

C. Trial Drilled Pier: Unit price as indicated for drilled pier, including backfilling.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.

D. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.
   2. Admixtures.
   3. Steel reinforcement and accessories.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

F. Field quality-control reports.

G. Other Informational Submittals:
   1. Record drawings.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.

C. Drilled-Pier Standard: Comply with ACI 336.1 unless modified in this Section.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
   1. Notify all affected parties including Owner no fewer than five (5) days in advance of proposed interruption of utility.
   2. Do not proceed with interruption of utility without Owner's written permission.

C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
   1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
   2. The geotechnical report is referenced elsewhere in the Project Manual.

D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Refer Section 03 20 00.

2.2 CONCRETE MATERIALS

A. Refer Section 03 30 00 and Structural General Notes.

2.3 STEEL CASINGS

A. Steel Pipe Casings: ASTM A 283, Grade C, or ASTM A 36, carbon-steel plate, with joints full-penetration welded according to AWS D1.1.

B. Corrugated-Steel Pipe Casings: ASTM A 929, steel sheet, zinc coated.

2.4 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.

C. Proportion normal-weight concrete mixture as follows:
   1. As indicated in Structural General Notes.

2.5 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
   1. Obstructions: Unclassified excavation may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions.
   2. Obstructions: Unclassified excavated materials may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. Payment for removing obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work will be according to Contract provisions for changes in the Work.

B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
   1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
   2. Remove water from excavated shafts before concreting.

D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
   1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
   2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.

E. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.

F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
   1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.

G. Bells: Excavate bells for drilled piers to shape, base thickness, and slope angle indicated. Excavate bottom of bells to level plane and remove loose material before placing concrete.

H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
   1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

3.3 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.

D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.

E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.

F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
   1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.

B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
   1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
   2. Vibrate top 60 inches of concrete.

C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
   1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.

D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.

E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
   1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.

F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Drilled piers.
   2. Excavation.
   3. Concrete.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
   1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities will be determined by testing and inspecting agency. Final evaluations and approval of data will be determined by Architect.

D. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94.
   1. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
   2. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and 80 deg F and above, and 1 test for each set of compressive-strength specimens.
   3. Compression Test Specimens: ASTM C 31; one set of four standard 6-inch x 12-inch cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.
   4. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and 1 specimen will be retained in reserve for later testing if required.
   5. If frequency of testing will provide fewer than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   6. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
   8. Report test results in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
   9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
   10. Additional Tests: Testing and inspecting agency will make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.

a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.

11. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports for each drilled pier as follows:
1. Actual top and bottom elevations.
2. Actual drilled-pier diameter at top, bottom, and bell.
3. Top of rock elevation.
4. Description of soil materials.
5. Description, location, and dimensions of obstructions.
6. Final top centerline location and deviations from requirements.
7. Variation of shaft from plumb.
8. Shaft excavating method.
9. Design and tested bearing capacity of bottom.
10. Levelness of bottom and adequacy of cleanout.
11. Ground-water conditions and water-infiltration rate, depth, and pumping.
12. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary or permanent casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
14. Bell dimensions and variations from original design.
15. Date and time of starting and completing excavation.
16. Inspection report.
17. Condition of reinforcing steel and splices.
18. Position of reinforcing steel.
19. Concrete placing method, including elevation of consolidation and delays.
20. Elevation of concrete during removal of casings.
21. Locations of construction joints.
22. Concrete volume.
23. Concrete testing results.
24. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 63 29

SECTION 311000
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and [**removing site utilities**] [**abandoning site utilities in place**].
7. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile,and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and [**indicated on Drawings**] [**defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated**].

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at [**Project site**]

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises[**where indicated**]

D. Utility Locator Service: Notify [**utility locator service**] [**Miss Utility**] [**Call Before You Dig**] [**Dig Safe System**] [**One Call**] for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control[**and plant-protection**] measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with [**MPI #79, Alkyd Anticorrosive Metal Primer**] [**or**] [**SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating**] VOC limit in subparagraph below is the EPA limit for rust-preventive architectural coatings; revise to suit Project.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain[**or to be relocated**]. [**Flag**] [**Wrap a 1-inch (25-mm) blue vinyl tie tape flag around**] each tree trunk at 54 inches (1372 mm) above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed[**or abandoned in place**].

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than [**two**] days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections and Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of [**18 inches (450 mm)**] below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and [**stockpile in areas approved by Architect**] [**dispose of off-site**].

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil [**to depth indicated on Drawings**] [**to depth of 6 inches (150 mm)**] in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 311013
SITE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes stripping of existing weeds and grasses.

1.2 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-preparation operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Qualifications: Work shall be performed by personnel trained and experienced in the work and shall be done under the direct supervision of a superintendent on Contractor's staff.

B. Workmanship: Perform work in conformance with recognized acceptable practices. Where job requirements require deviation from those practices, obtain approval from Landscape Architect before processing.

1.4 EXISTING CONDITIONS

A. Protection of Existing Utilities:

1. Existence and location of underground items are not guaranteed. Investigate and field verify before starting work. Excavation and backfill in the vicinity of existing items of work shall be carried out with extreme caution.
2. Contractor shall be held responsible for any damage and for maintenance and protection of existing utilities.
3. Indicate on record drawings where there is conflict between field conditions and drawings.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Machinery: Machinery shall be approved by Owner. Contractor shall provide equipment and machinery sufficient for proper execution of Work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.4 EXISTING WEED AND GRASS STRIPPING

A. Strip area with work limits shown on Drawings of lawns and vegetation under the direction of the Landscape Architect.

B. Method of removal shall remove a minimum amount of topsoil and shall be event so that there is not a general change to overall grading.

3.5 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311013

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SECTION 32 13 13
PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the requirements for providing, placing, curing and protecting Portland cement concrete paving, with or without reinforcement as indicated, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute

   a. 301: Specifications for Structural Concrete for Buildings.

   b. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.

2. ASTM: American Society for Testing and Materials

   a. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (with Supplement + S1).

   b. C 150: Specification for Portland Cement Type I or Type II.

   c. C 309: Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

   d. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

   e. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).

   f. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).

   g. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

h. D 3405: Specification for Joint Sealants, Hot-Poured, for Portland Cement Concrete Pavement.

3. TxDOT: Texas Department of Transportation.

a. Standard Specifications for Construction of Highways, Streets, and Bridges -- Latest Edition.

1) Item 360, CONCRETE PAVEMENT.

B. Formwork Tolerances

Formwork tolerances shall be as specified in ACI 316 R, Chapter 5.

C. Finishing Tolerance

The top surface of pavement shall have a Class B tolerance as specified in ACI 316 R, Chapter 12.5 and ACI 301, Chapter 11.9.

D. The Portland Cement Paving Contractor/Subcontractor shall provide WISD with evidence of his/her ability to perform the specified work. This evidence shall be in the form of at least five (5) successfully completed Portland Cement paving projects for either the WISD, Harris County, City of Houston or any combination of the three.

This list of projects shall be submitted to WISD prior to any paving operations beginning so that WISD will be able to inspect the quality of workmanship at the site and approve the Contractor/Subcontractor.

1.3 SUBMITTALS

A. In accordance with Section 00 72 00 – Uniform General Conditions, Sub-Section UGC 8.3 for Waller Independent School District (WISD) projects, the following shall be submitted:

1. Reinforcement Materials

a. As required in Section 032100 - Concrete Reinforcement of these Specifications.

2. Concrete Materials

a. As required in Sections 321373.19 - Cast-in-Place Concrete of these Specifications.

3. Joint Materials

a. As required in Section 321319 – Concrete Pavement Joints.

1.4 EXTENDED WARRANTY

A. Manufacturer of joint sealant shall provide at least a 1-year written warranty against material degradation or failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit WISD's rights or remedies as may otherwise be afforded under law or statute.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Forms

Metal forms, as indicated in ACI 316 R, Chapter 5.

B. Welded Steel Wire Fabric
Plain wire fabric, as specified in Section 032100 - Concrete Reinforcement of these Specifications.

C. Reinforcing Steel Bars

As specified in Section 032100 - Concrete Reinforcement of these Specifications.

D. Dowel Bars

Smooth, ASTM A 615 + S1, Grade 60, new billet steel, coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.

E. Dowel Bar Sleeves

Sleeves, PVC or plastic, slightly larger than dowel bars, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.

F. Concrete

Class 3000, as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

G. Membrane Forming Curing Compound

ASTM C 309, Type 2, unless otherwise directed.

H. Joint Materials

1. Preformed Expansion Joint Filler: ASTM D 1751, ASTM D 1752, and D 1565.

2. Joint Sealing Material: See Section 321319, Concrete Pavement Joints of these Specifications.

I. Form Coating

Commercial formulation form-coating compounds that will neither bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces. Contractor shall submit sample for approval prior to use.

J. Precast Concrete Wheel Stops

Accurately formed and finished, of size and shape as indicated, reinforced and anchored as required. Fabricate wheel stops on Site or substitute approved precast units of like design and dimensions.

K. Epoxy Bonding Grout

ASTM C 881, Type I.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION

A. Prepared subgrade shall be proof rolled to check for unstable areas and need for additional compaction. Do not begin paving work until such deficiencies have been corrected and subgrade is ready to receive paving.

B. Loose material shall be removed from the compacted subgrade immediately prior to placing concrete and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

A. Forms shall be set in accordance with the recommendations of ACI 316 R, Chapter 5, and as specified herein.

B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement, and to ensure that forms shall remain in place not less than 24 hours.

C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

A. Joints and reinforcement shall be installed in accordance with the recommendations of ACI 316 R, Chapter 6, as specified in Section 032100 - Concrete Reinforcement of these Specifications, and in Section 321319 - Concrete Pavement Joints.

B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

A. Concrete shall be placed and finished in accordance with the recommendations of ACI 316 R, Chapters 10 and 12.5, and as specified in Section 321373.19 - Cast-in-Place Concrete of these Specifications.

3.5 CURING AND PROTECTING CONCRETE

A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.

B. Protection as recommended in ACI 316 R; Chapter 11 shall be provided until written acceptance by KISD.

3.6 INSTALLATION OF CONCRETE WHEEL STOPS

A. Install concrete wheel stops where indicated and in accordance with manufacturer's installation instructions as required. Where dowels are to be embedded into concrete, embed with epoxy bonding grout.

3.7 FIELD QUALITY CONTROL

A. Coring

After the pavement is placed and before final acceptance the Engineer may elect to determine pavement thickness by cores cut from the pavement or direct measurement of the edge thickness. Acceptable pavement thickness shall be deficient by no more than two tenths of an inch. Core holes shall be promptly repaired with concrete conforming to the requirements specified herein by the Contractor at no cost to WISD.

B. Deficient Pavement Price Adjustments

Where the average thickness of pavement is deficient in thickness by more than 0.2 inch, but not more than 0.75-inch, payment will be made at an adjusted price as specified in the following table.

Concrete Pavement Deficiency

Deficiency in Thickness Determined by Cores Inches	Proportional Part of Contract Price Allowed
0.00 to 0.20	100 percent
Over 0.20 to 0.30	80 percent
Over 0.30 to 0.40	72 percent
Over 0.40 to 0.50	68 percent
Over 0.50 to 0.75	57 percent

Any area of pavement found deficient in thickness by more than 0.75 of an inch but not more than one inch or 1/8 of the plan thickness, whichever is greater, shall be evaluated by the Engineer. If, in the judgment of the Engineer, the area of such deficiency should not be removed and replaced, there will be no payment for the area retained. If, in the judgment of the Engineer, the area of such deficiency warrants removal, the area shall be removed and replaced, at the Contractor's entire expense, with concrete of the thickness shown on the plans. Deficient pavement shall be removed for the full area of the slab between joints, or between pre-established limits.

END OF SECTION 32 13 13

SECTION 32 13 19
CONCRETE PAVEMENT JOINTS

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.

2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.

3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.

4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Concrete Sidewalks, and Concrete Driveways.

5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).

6. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 REFERENCES

A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

B. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

C. ASTM D 3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.

D. TxDOT Tex-525-C - Tests for Asphalt and Concrete Joint Sealers

1.04 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).

PART 2 P R O D U C T S

2.01 BOARD EXPANSION JOINT MATERIAL

A. Filler board of selected stock. Use wood of density and type as follows:

1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.

2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

2.02 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

2.03 JOINT SEALING COMPOUND

A. Conform joint sealants to one of sealant classes described in this section.

B. Conform hot-poured rubber-asphalt compound to ASTM D 3405.

C. Two-component Synthetic Polymer.

1. Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles.

2. Cure sufficiently at average temperature of 25 ± 1 C (77 ± 2 F) so as not to pick up under wheels of traffic in maximum three hours.

3. Performance requirements, when tested in accordance with TxDOT Tex- 525-C, shall meet above curing times and requirements as follows:

Cold-Extruded and Cold-Pourable (Self-Leveling) Specifications	
Property	**Requirement**
Penetration, 25 C (77 F) 150 g Cone, 5 s, 0.1 mm (in.), maximum	130
Bond and Extension 50%, -29 C (-20 F), 3 cycles: *Dry Concrete Block *Steel blocks (Primed, if recommended by manufacturer) *Steel blocks shall be used when armor joints are specified	Pas s Pas s
Flow at 70 C (158 F)	None
Water content % by mass, maximum	5.0
Resilience: * Original sample, % min. (cured) * Oven-aged at 70 C (158 F), % min.	50 50
Cold-extruded material only - Cold Flow (10 minutes)	None

After bond and extension test, there shall be no evidence of cracking, separation or other opening that is over 3 millimeters (1/8 inch) deep in sealer or between sealer and test blocks.

4. Provide cold-extruded type for vertical or sloping joints.

5. Provide self-leveling type for horizontal joints.

D. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete Joints. This

shall be a single component self-leveling silicone or polyurethane material that is compatible with both asphalt and concrete pavements. The sealer shall not require a primer for bond; a backer rod shall be required which is compatible with the sealant; no reaction shall occur between rod and sealant. When tested in accordance with TxDOT Tex-525-C, self-leveling sealant shall meet following requirements:

Self-Leveling, Low Modulus Silicone or Polyurethane Sealant	
Property	**Requirements**
Tack Free Time, 25 ± 1 C (77 ± 2 F), minutes	120 maximum
Nonvolatile content, % by mass	93 minimum
Tensile Strength and 24-Hour Extension Test: * Initial, 10-day cure, 25 ± 1 C (77 ± 2 F), kPa (psi) * After Water Immersion, kPa (psi) * After Heat Aging, kPa (psi) * After Cycling, -29 C (-20 F), 50%, 3 cycles, kPa (psi) * 24 Hour Extension	* 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * 21 to 69 (3 to 10) * Pass (All Specimens) After 24 hours, there shall be no evidence of cracking, separation or other opening that is over 3 mm (1/8 in.) deep at any point in the sealer or between the sealer and test blocks.

2.04 LOAD TRANSMISSION DEVICES

C. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.

D. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

2.05 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

C. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Project Manager.

PART 3 E X E C U T I O N

3.01 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

3.02 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.03 EXPANSION JOINTS

A. Place 3/4-inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.04 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.05 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

3.06 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing

consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.07 JOINTS FOR CURB, CURB AND GUTTER

A. Place 3/4-inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement, at end of radius returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120- foot centers.

3.08 JOINTS FOR CONCRETE SIDEWALKS

A. Provide 3/4-inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab.

3.9 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like new working condition throughout joint sealing operation and be approved by Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to

joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION 32 13 19

SECTION 32 13 73.19
CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes furnishing materials and installation of cast-in-place concrete as indicated on the Drawings and/or specified herein.

B. Full cooperation shall be given to other trades to install embedded items. Suitable templates insert and sleeves shall be provided for setting items not placed in the forms.

C. All concrete work shall conform to the requirements of ACI 318-95 and CRSI Standards, unless specifically noted otherwise.

1.02 QUALITY ASSURANCE

A. Prior to starting concrete operations, the Contractor shall name his source of supply for concrete materials and shall submit representative samples and reports of quality tests for approval.

B. The Contractor will engage the services of a recognized independent testing laboratory, approved by the Owner, to perform the following services, (in accordance with ASTM E 329-77) the cost of which shall be paid by the Contractor:

1. Design the concrete mixtures specified, make quality tests of materials, inspect the proportioning and mixing of all concrete for this project.
2. Slump Test, ASTM C-143, shall be taken as often as required to provide the specified consistency to concrete.
3. Cast and test of at least 6 cylinders for each day's pour or for each 100 cubic yards or fraction thereof. Cylinders shall be cured and tested in accordance with ASTM specifications for control tests. Cylinders shall be tested at 7 and 28 days. The Contractor shall provide insulated storage room with heat when necessary to store control cylinders, and a protected, fenced-in space for storage of field cylinders, which approximates the condition of curing of the concrete being sampled.

C. In the event that concrete fails to meet strength requirements of these Specifications, the Engineer may require at no additional cost to the Owner, tests in accordance with the "Standard Methods of Securing, Preparing and Testing Specimens of Hardened Concrete for Compressive and Flexural Strengths", ASTM C42, or order load tests in accordance with Chapter 20 of the ACI Building Code 318-95, to be made on the portions of the structure containing questionable concrete. Suitable appliances and methods of loading

and measuring shall be provided by the Contractor. The portions of the structure which are found by the Architect/Engineer to contain defective concrete shall be removed and reconstructed in a satisfactory manner at the Contractor's expense. Concrete strength tests are to conform to Chapter 4 of the ACI Building Code 318-95.

D. The laboratory shall have free access to material stockpiles, batching and mixing plants, and job site. The Contractor shall provide adequate assistance to the laboratory in securing specified samples for tests.

E. Contractor shall give the Owner and laboratory reasonable notice before beginning any pours (at least 24 hours).

F. The laboratory shall supply a daily report of concrete and materials testing and inspection to the Architect, Engineer, Design/Builder, Contractor and Owner.

G. Concrete batched away from the job and delivered in mixer or agitator trucks shall conform to requirements of ASTM C94.

H. Authority and Duties of Laboratory Personnel:
Inspectors shall inspect the materials and the manufacture of concrete as specified and shall report to the Owner's Representative, Contractor, Architect and the Engineer the progress thereof. Also, when it appears that the material furnished and the work performed by the Contractor fail to fulfill the specification requirements and contract, the inspector shall direct the attention of the Contractor to such failure or infringement. Such inspection shall not relieve the Contractor of any obligation to furnish acceptable materials or to provide the concrete quality in the structure that is in strict accord with plans and specifications. The inspector are not authorized to revoke, alter, relax, enlarge, or release any portion of the work, but in case of any dispute arising between the inspector and the Contractor as to materials furnished or in the manner of performing the work the inspector shall have the authority to reject materials or suspend the work until the question at issue can be referred to the Engineer. The inspector shall not act as foreman or perform other duties for the Contractor. In no case shall any advice or omission on the part of the inspector relieve the Contractor of responsibility for completing the work in accordance with the plans and specifications and the fulfillment of the contract. The work will be inspected as it progresses, but failure to reject any defective work or materials shall not in any way prevent later rejection when such defect is discovered or obligate the Engineer for final acceptance. Any expense incidental to the investigation and determination of actual quality of any questionable material shall be borne by the Contractor.

I. Sampling and Testing:

1. All materials shall be sampled, tested in accordance with appropriate ASTM Standards, and approved before inclusion in any work on this project.
2. Samples for testing shall be furnished by the Contractor.
3. Rejected material shall be immediately removed from the site.
4. Reinforcing steel shall be tested by heat in shops and by random sampling in the field when required by the Architect/Engineer or Owner.

1.03 SUBMITTALS

A. Shop Drawings: The Contractor is to include as a part of his expense the cost of completely dimensioned concrete shop drawings embracing plans and details, bending diagrams, steel order list, placing diagrams, which service shall be furnished by a structural engineer licensed in the State of the project. No portion of the contract documents shall be reproduced and submitted as shop drawings. The shop drawings shall include the following:

1. Foundation Plan – fully dimensioned, foundation schedule and details, wall sections, mechanical pad details, and related miscellaneous details. All details plans and sections shall show reinforcing.
2. Pier Details and Pier Schedule.

3. Wall Elevations – fully dimensioned showing all thicknesses, reinforcing sections, form joints and all items that will leave visible marks or interruptions in the finished surfaces.
4. Necessary Floor Plans – fully dimensioned plans with all depressions, rises, reinforcing steel, to include placement and accessories.
5. Miscellaneous Items – All other reinforced concrete items shall be drawn at such scale as to give full dimensions, details and reinforcing with accessories as required.

B. All reinforcing shall be detailed, ordered, and fabricated in accordance with the latest ACI Manual of Standard Practice for Detailing Concrete Structures and the CRSI Manual of Standard Practice.

C. Submit Shop Drawings to the Architect for review, prior to release to field. Fabrication of reinforcing steel shall not be started until Drawings have been reviewed and stamped.

D. Prior to the placement of any concrete, design mixes for each type of concrete shall be submitted and approved by the testing laboratory. Mix designs shall include all required and shall include each type of aggregate and admixture to be used.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Concreting shall not be started during rain, sleet or snow and shall not be continued during such weather after having been started except long enough to come to a suitable cutoff point. Concrete placed during rain shall have the cement content increased in the amount of one sack of cement per cubic yard of concrete. All forms and earth forms shall be free of ice and frozen surfaces.

B. No concrete shall be poured unless temperature is 40 degrees and rising or unless special precautions are taken (approved by the Architect). Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing and near freezing weather. All concrete shall have a temperature of between 50 degrees and 90 degrees F when depositing, and shall be maintained within this temperature range for at least 72 hours or for as much time as is required to insure the proper rate of curing. No salt or other chemicals shall be added to prevent freezing. The covering or other method used for temperature protection shall remain in place 24 hours after artificial heat is discontinued. The recommended Practice for Cold Weather
Concreting" (ACI 306) and the "Recommended Practice for Hot Weather Concreting" (ACI 305) shall be accepted as good practice.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be subject to approval. Any change of materials specified shall be submitted for approval and such change, if acceptable, shall be used only when specifically authorized in writing.

B. Cement shall conform to the following specifications:

1. Coarse and fine aggregate shall conform to requirements of ASTM C33 or Federal Specification SS-S-281a.
2. All coarse aggregates shall be crushed limestone.
3. The maximum size of coarse aggregate shall not be larger than 1", 1/5 of the narrowest dimension between forms of the member for which the concrete is to be used, nor larger than ¾ the minimum clear spacing between reinforcing bars. Coarse aggregate for all concrete exposed to the weather shall be crushed limestone with a #57 gradation.
4. Absorption in coarse aggregate shall not exceed 5%.

5. The fineness modulus for fine aggregate used shall not vary more than 0.2 from the approved sample without approval. Fineness modulus to be 2.9.

C. All concrete shall be normal weight unless specifically noted otherwise.

1. Normal weight concrete shall be approximately 145 to 155 pounds per cubic foot.
2. Lightweight concrete shall not exceed 110 pounds per cubic foot and shall be made of normal and normal weight fines.

D. Water shall be clean, fresh, and free from injurious amounts of oils, acids, alkali or organic material or other substances that may be deleterious to concrete or steel.

E. Non-shrink grout shall be factory pre-mixed non-shrink, non-metallic grout containing mineral aggregate and shall require only the addition of water at the site. Grout shall be “EUCO NS” (non-metallic) as manufactured by the Euclid chemical company. “Masterflow 713” (non-metallic) as manufactured by Master Builders or approved equal. The grout shall conform to ASTM C-1107 and CRD-621, “Corps of Engineers Specifications for Non-Shrink Grout,” and shall be tested in accordance with ASTM C827.

F. Waterstops shall be 9” Dumbbell type, Model No. 751 as manufactured by Greenstreak, at locations shown on drawings.

2.02 QUALITY AND PROPORTIONING

A. It shall be the Contractor’s responsibility to furnish concrete which will conform to the quality and strength specified.

B. Strengths, unless otherwise indicated on plans or in specifications or in the table below, shall be 3000 psi minimum 28 day compressive strength.

1.	Columns	4000psi
2.	Slabs above ground floor	3000psi
3.	Concrete Beams	4000psi
4.	Footing and Piers	3000psi
5.	Pilasters, Walls	4000psi
6.	Slabs on Grade	4000psi
7.	Tilt Panels	4000psi
8.	Exterior Concrete	4000psi (5% Air Entrained)

C. Proportioning shall follow the limiting factors in the following table:

	Concrete Class 3000#	4000#
1. Minimum allowable compressive strength at		
a. 28 days (psi)	3000	4000
2. Maximum allowable water per sack of cement:	(gal/sack):	
3. Non-air entrained:	6-1/2	5-1/2
4. Air entrained:	5-1/4	5
5. Slump, range in inches:	3-5	
6. Minimum sacks of cement per cu. yd.	5-1/4	6-1/4
7. Water reducing agent oz./100# cement:	3	

8. Proportioning on the basis of field experience shall conform to Section 5.3 of ACI 318-89 or the maximum water/cement ratio in Section 5.4 of ACI 318-89.

D. Design mixes shall be established to produce average strengths higher than specified by the amounts specified in Chapter 5 of ACI 318-95.

E. Admixtures:

1. Calcium Chloride shall not be used.
2. An approved air-entraining agent (ASTM C260) shall be added at the mixer with accurate dispenser to produce entrained air 4-6% by volume in all concrete subject to weathering conditions.
3. An approved water-reducing agent equal to those manufactured by mixer with an accurate dispenser.
4. These and other admixtures shall be used only with specific approval. Tests for design mixes shall be made with the admixtures included.
5. Fly ash shall not be permitted.

F. The concrete shall be of such consistency and composition that it can be worked readily into the corners and angles of the forms and around reinforcement without permitting materials to segregate or free water to collect on the surfaces. Within the limiting requirements the Contractor shall adjust the consistency of the concrete as may be necessary to produce mixtures which will be placeable with reasonable methods of placing and compacting. The Contractor shall maintain on the job at all times adequate extra cement to be used at the rate of ½ sack cement per cubic yard concrete for each 2" slump increase for corrections due to wetness desired or obtained. No water shall be added to concrete except under the direct supervision of the engineer or his appointed representative. Under no circumstances will the addition of more than 2 gallons of water per cubic yard of concrete be allowed at the site.

G. Measurement of Materials:

1. Cement shall be measured by the sack or half-sack unless cement is weighed for each batch.
2. Aggregates shall be proportioned separately by weight with proper compensation for weight of moisture; weighing equipment shall be accurate within 1%.
3. Water shall be measured by an approved device capable of accurate measurement to one pint.

H. Concrete shall be from a single source for each major pour.

2.03 FORMS

A. Refer to Section 03100 for requirements for concrete forms.

2.04 REINFORCEMENT

A. Refer to Section 03200 for requirements for reinforcement.

2.05 EXPANSION MATERIALS

A. Verify compatibility of joint filler with sealant specified.

B. All expansion joints on grade shall be pre-formed non-extruding resilient type, bituminous or bonded cork (ASTM D994 or ASTM D1751).

C. Other expansion joints may comply with ASTM D1752 – "Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction."

Manufacturer's certification and material submittal are required.

2.06 CURING, SEALING AND HARDENING COMPOUNDS

A. Liquid Curing and Sealing Compounds – General requirements

1. Curing Compounds: Comply with ASTM C 309, Type 1, Class B.
   a. Non-yellowing formulation where subject to ultra violet light.
   b. Curing and Sealing Compound: Where indicated, providing curing and sealing formulation with long-lasting finish that is resistant to chemicals, oil, grease, deicing salts, and abrasion.

2. Curing and Hardening Compound: Free of waxes, resins or oils; meet water retention requirements of ASTM C 309; penetrate concrete to change free lime to calcium silicate forming a permanently dense, hard surface.

3. The curing compound shall have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per square cm. When applied at a coverage rate of 300 square feet per gallon. Manufacturer's certification is required.
   a. Provide L&M "dress & Seal 30" or Master Builders "Masterseal 66."

   b. Dissipating Resin Curing Compound: The compound shall be a dissipating resin type compound, conforming to ASTM C309, Type I, "Kurez DR" by The Euclid Chemical Company or approved equal. The film must chemically break down in a two to four week period after application.

4. Curing compounds shall not be used on any surface against which additional concrete or other cementious material are to be bonded.

2.07 VAPOR RETARDERS (BARRIERS)

An approved vapor barrier shall be placed as called for in the Contract Documents. Supply a vapor barrier that complies with one of the following:

A. ASTM E 1745, Class A: A three-ply, nylon- or polyester-cord reinforced, high-density polyethylene sheet; laminated to a nonwoven geotextile fabric, 30 mils (0.76 mm) thick.

B. ASTM E 1745, Class B: A five-ply nylon- or polyester cord-reinforced, high-density polyethylene sheet; 10 mils (0.25 mm) thick.

C. ASTM E 1745, Class C: One of the following materials, or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick:

1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 10 mils (0.25 mm) thick.

2. Three-ply, nylon- or polyester-cord-reinforced, laminated, high-density polyethylene sheet; 7.8 mils (0.18 mm) thick.

D. Submittal is required.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until satisfactory conditions have been corrected.

3.02 CONDUITS, HANGERS, SUPPORTS, ANCHORS, ETC.

A. The Contractor shall see that all necessary bolts and anchors of all other trades employed on this structure including conduits, sockets, inserts, sleeves, etc., will be placed by their respective trades or shall himself place them to details before concreting a given section of work. He shall see that these items do not interfere with the reinforcement.

B. No aluminum conduit or product containing aluminum or any other material detrimental to concrete shall be embedded in concrete.

C. All openings in slabs, beams, columns, and footings, which are not shown on the structural plans, must be approved by the Engineer. The maximum diameter of embedded pipes or conduit shall be 1/3 times the slab or wall thickness. The minimum center-to-center spacing of embedded pipes or conduits shall be three times the outside diameter. For pipes or conduits of different diameters, the minimum edge-to-edge spacing shall be two times the smaller diameter.

D. All pipes and conduits providing flow able material conveyance which penetrate beams, footings, or walls shall be provided with sleeves of an appropriate size and material to provide movement for expected settlements or deflections.

3.03 PREPARATION

A. Concrete placing shall not be started until all necessary preparations have been completed and approval has been given. Preparations shall consist of completing all form work involved, placing all reinforcing steel, pipes, conduits, sleeves, hangers, anchors, fastening devices, waterproofing and such other work to be built into the concrete in the section to be poured, and any other preparations herein required for the concreting operations. Free water and any mud or debris shall be removed from forms and excavations to be occupied by concrete. Approved equipment shall be available on the job site for heating and/or protecting the concrete whenever freezing temperatures are likely to occur within the curing period. Ice or chilled water may be required to control concrete temperature in hot weather to below 90 degrees F.

B. Slabs-on-grade shall be placed on a properly leveled and thoroughly compacted sub grade, equal to 93% maximum dry density. All subsoil’s for slabs shall be approved before placing concrete.

C. Approved equipment shall be provided for heating concrete materials and/or protecting the concrete whenever freezing temperatures are likely to occur within curing period.

3.04 INSTALLATION

A. Concrete shall be conveyed from the mixer or transporting vehicle to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of materials or displacement of the reinforcing steel and which will avoid rehandling. For ready-mix concrete in an agitator truck, the elapsed time from mixer to placement shall not exceed 1-1/2 hours.

B. Concrete shall be deposited as nearly as practicable in its final position and shall have the qualities required. Concrete shall be deposited continuously in layers or sections of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause seams or planes of weakness. If sections cannot be placed continuously, proper construction joints shall be provided.

C. Concrete during and immediately after depositing shall be thoroughly compacted and worked around reinforcing and embedded fixtures and into all parts of forms by means of spades, rods and approved mechanical vibrators.
For thin walls or inaccessible portions, concrete shall be worked into place by vibrating or other approved method: Care shall be taken so as not to work concrete to the point where segregation occurs.

3.05 CONSTRUCTION AND CONTROL JOINTS

A. All horizontal and vertical construction joints shall be intentionally roughened to a full ¼" ± amplitude or have a continuous 2"x 4" keyway along the joint at contractor's option.

B. Provide reinforcing dowels to match the member reinforcing at the joint, unless noted otherwise.

C. Unless indicated otherwise, slabs-on-grade shall have construction or control joints spaced not to exceed 30 times the slab thickness in any direction. All discontinuous control or construction joints shall be reinforced with two (2) #4 x 48". See structural details. Construction joints shall not exceed a distance of 15'-0" O.C. in any direction.

D. Control joints shall be installed in slabs-on-grade so the length-to-width ratio of the slab is not more than 1.25:1. Control joints shall be completed within 12 hours of concrete placement. Control joints may be installed by:

1. Saw Cut to a depth of ¼ the thickness of the slab.
2. Tooled joints shall be made to a depth of ¼ the thickness of the slab.

E. Control joints in visually exposed walls, unless noted otherwise (shall line up with masonry and architectural joints, see drawings):

1. Vertical control joints at 10'-0" O.C.
2. Reinforcing shall be continuous through control and construction joints, unless noted otherwise.
3. Control joints in foundation walls shall line up with masonry control joints.

F. Control joints shall be installed in suspended slabs over steel decking by saw cutting along all interior grid lines. Joints centered above the purlins shall be ¾" deep and shall have #4x5'-0" at 16" O.C. reinforcing placed perpendicular to (and centered on) the purlin. Joints centered above the girders shall be ¾" deep and shall have #4x16'0" O.C. reinforcing placed perpendicular to (and centered on) the girder. The #4 bar reinforcing centered above the grid lines shall be in addition to the specified WWF,

which is continuous throughout the suspended slabs over steel decking. Reinforcing shall be placed 1” below the top of the slab.

3.06 FINISHING

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼” in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or surfaces that are covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, terrazzo, stone and other bonded applied cementious finish flooring material, and as otherwise indicated. After placing slabs, plane surface to a tolerance not exceeding ½” in 10’ when tested with a 10’ straightedge. Slope surfaces uniformly to drains where required. After leveling; roughen surface before final set, with stiff brushes, brooms or rakes.

F. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, and as otherwise indicated. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding ¼” in 10’ when tested with a 10’ straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth granular texture.

G. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system. After floating, begin final trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8” in 10’ when tested with a 10’ straightedge. Grind smooth surface defects, which would telegraph through applied floor covering system.

H. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect and Owner's Representative before application. See Section 02528 – Concrete Paving and Curbs.

I. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3-strength; second coat, ½-strength; third coat, 2/3-strength. Evenly apply each coat and allow 24 hours for drying between coats. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.07 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect. Cut out honeycomb, rock pockets, voids over ¼" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brushcoat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

B. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repair of Formed Surfaces: Remove and replace concrete having defective surface if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plant to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

F. Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

H. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to

blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

l. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same material to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finish concrete. Cure in same manner as adjacent concrete.

J. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Grove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry pack, consisting of one-part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact-dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours. Use epoxy-based mortar for structural repairs, where directed by the testing laboratory.

K. Repair methods not specified above may be used, subject to acceptance of Architect.

3.08 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.

C. Provide moisture curing by following methods:

1. Keep concrete surface continuously wet by covering with water.
2. Continuous water-fog spray.
3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

D. Provide moisture-cover as follows:

1. Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

E. Provide curing compound to slabs as follows:

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp proofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

F. Curing Formed Surfaces: Cure formed concrete surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.09 MISCELLANEOUS

A. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

END OF SECTION 32 13 73.19

SECTION 32 16 13
CONCRETE CURBS AND CURB & GUTTER

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section specifies the requirements for providing, placing, curing, and protecting Portland cement concrete curbs, and combination curbs and gutters, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute

   a. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.

2. ASTM: American Society for Testing and Materials

   a. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (with Supplement + S1).

   b. C 150: Specification for Portland Cement Type I or Type II.

   c. C 309: Specification for Liquid Membrane - Forming Compounds for Curing Concrete.

   d. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Closed Cell).

   e. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).

   f. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

   g. D 3405: Specification for Joint Sealants, Hot-Poured, for Portland Cement Concrete Pavement.

3. FS: Federal Specifications and Standards

   a. TT-P-86: Paint, Red-Lead-Base, Ready-Mixed.

B. Finishing Tolerance

The top surface of curbs and combination curbs and gutters shall have a Class A tolerance as specified in ACI 316 R, Chapter 12.5.

1.3 SUBMITTALS

A. In accordance with Waller Independent School District (WISD), the following shall be submitted:

1. Reinforcement Materials

   a. As required in Section 032100 - Concrete Reinforcement of these Specifications.

2. Concrete Materials

   a. As required in Sections 321373.19 - Cast-in-Place Concrete of these Specifications.

1.4 EXTENDED WARRANTY

A. Manufacturer of joint sealant shall provide at least a 1-year written warranty against material degradation and failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit LIT rights or remedies as may otherwise be afforded under law or statute.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms

Either wood or metal, of the size and shape necessary for forming the item, straight and free of warp.

B. Reinforcing Steel Bars

As specified in Section 032100 - Concrete Reinforcement of these Specifications.

C. Dowel Bars

Smooth, ASTM A 615 + S1, Grade 60, new billet steel, unbonded ends painted with red-lead-base paint, FS TT-P-86, Type I and coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.

D. Dowel Bar Expansion Caps

PVC or plastic cap, slightly larger than dowel bar, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.

E. Concrete

Class 3000, as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

F. Membrane Forming Curing Compound

ASTM C 309, Type 2, unless otherwise directed.

G. Joint Materials

1. Preformed Expansion Joint Filler: Nonextruding and resilient bituminous type, ASTM D 1751.

2. Joint Sealing Material: See Section 321373 of these Specifications.

H. Form Coating

Commercial formulation form-coating compound that will not bond with, stain nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Prepared subgrade shall be inspected for unstable or unsuitable areas and need for additional compaction. Notify the Engineer in writing of such deficiencies. Do not begin curb construction until all such deficiencies have been corrected.

B. Loose and foreign material shall be removed from the compacted subgrade immediately prior to placing concrete, and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

A. Forms shall be set to the line and grade indicated and shall be securely staked to maintain set position during depositing and curing of concrete. The inside form shall be rigidly attached to the outside form.

B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement and to ensure that forms shall remain in place not less than 24 hours.

C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

A. Reinforcement shall be installed as indicated on the Drawings and as specified in Section 032100 - Concrete Reinforcement of these Specifications. Joints shall be installed where indicated on the Drawings and in accordance with Section 321319 – Concrete Pavement Joints of these Specifications.

B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

A. Concrete shall be placed and finished as specified in Section 321373.19 - Cast-in-Place Concrete of these Specifications, and ACI 316 R, Chapters 10 and 12.5.

B. After concrete has been struck off and has sufficiently set, the exposed surfaces shall be worked with a wood float. The exposed edges shall be rounded using an edging tool.

C. After form removal, the surfaces of the curb or combination curb and gutter shall be plastered with a mortar consisting of one-part Portland Cement and two parts fine aggregate. Mortar shall be applied with a template constructed to the shape and dimensions of the item to be plastered. All exposed surfaces shall be brushed to a uniform smooth texture.

3.5 CURING AND PROTECTING CONCRETE

A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.

B. Protection as recommended in ACI 316 R; Chapter 11 shall be provided until written acceptance by the Engineer.

END OF SECTION 32 16 13

SECTION 324116
LANDSCAPE DRAINAGE

PART 1 — GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid Storm Drain Pipe, indicated on Landscape Drawings.
2. Perforated Subdrain Pipe System indicated on Landscape Drawings.
3. Area Drains in Aggregate indicated on Landscape Drawings.
4. Area Drains in Planting indicated on Landscape Drawings.
5. Catch Basin in Planting indicated on Landscape Drawings.
6. Drain mat Installed Horizontally indicated on Landscape Drawings.
7. Geotextile Fabric.
8. Miter Drains.
9. Clean-outs Indicated on the Landscape Drawings.

1.2 REFERENCES

A. ASTM — American Society for Testing and Materials:

1. A 48-00 — Specification for Gray Iron Castings.
2. D 1248-00a — Specification for Polyethylene Plastics Molding and Extrusion Materials.
3. D 1557-00 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
4. D 2321-00 — Practice for Underground Installation of Flexible Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
5. D 2729-96a — Specification for PVC Sewer Pipe and Fittings.
6. D 3034-00 — Specification for Type PSM PVC Sewer Pipe and Fittings.
7. D 3350-02 — Specification for Polyethylene Plastics Pipe and Fitting Materials.

8. F 405-97 — Specification for Corrugated Polyethylene Tubing and Fittings.

9. F 679-01 — Specification for PVC Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

10. F 949-01a — Specification for PVC Corrugated Sewer Pipe with Smooth Interior and Fittings.

1.3 DEFINITIONS

A. PVC: Polyvinyl Chloride.

B. SDR: Standard Dimensional Ratio.

C. HDPE: High Density Polyethylene.

D. Finished Subgrade Surface: Final soil subgrade surface on which topsoil, aggregate base, or paving is installed.

E. Acceptance, Acceptable, or Accepted: Acceptance by the Landscape Architect in writing.

F. Excessive Compaction of Soil: Planting area soil compaction greater than 75 percent maximum dry density as determined by ASTM D 1557.

1.4 SUSTAINABILITY

A. Sustainable Design Intent: Comply with project GREEN BUILDING requirements intended to achieve certification, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018113: “Sustainable Design Requirements” for certification level and certification requirements.

B. Green Building Performance Criteria: The Contractor shall implement practices and procedures to meet the Project’s GREEN BUILDING requirements. The Contractor shall ensure that the requirements related to these goals, as defined in Section 018113: “Sustainable Design Requirements”, and as specified in this Section, are implemented to the fullest extent. Substitutions or other changes to the work shall not be proposed by the Contractor or their sub-contractors if such changes compromise the stated GREEN BUILDING Performance Criteria.

1.5 SUBMITTALS

A. General Requirements: Refer to Division 1.

B. Product Data:

1. Pipe and Pipe Fittings.

2. Geotextile Fabric.

3. Clean-out Adaptor Coupling and Plug.

4. Drain Rock.

5. Flexible Coupling.

6. Drain Grates.

7. Miter Drains.

8. Drain mat.

C. Test Reports: Sand backfill sieve analysis with date less than 2 weeks old.

D. Record Documents:

1. Maintain on the construction site a record of materials and equipment installed each day.

2. Daily record information neatly to scale, on full-size prints of the Construction Documents.

3. Include changes, substitutions, and manufacturer's names and catalog numbers for materials and equipment.

4. Show actual locations of drains, grates, clean-outs and piping.

5. Show dimensions from easily-identifiable permanent structures such as walls, curbs, buildings or walks.

6. Procure reproducibles of the current Construction Documents from the Owner.

7. Upon Final Completion, deliver information noted on reproducibles to the Owner.

1.6 QUALITY ASSURANCE

A. Contractor Qualifications: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Storage:

1. Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.

2. Protect PVC pipes and fittings from direct sunlight.

3. Store pipe on firm, well-draining, continuous surface equal to or longer than pipe.

1.8 SITE CONDITIONS

A. Environmental Requirements: Lay and join pipe in dry trenches.

B. Existing Conditions:

1. Prior to Work commencement, review and clearly mark in field horizontal and vertical locations of existing public underground utilities and structures with appropriate utility companies.

2. Prior to Work commencement, review and clearly mark in field horizontal and vertical locations of existing private underground utilities and structures with the Owner's Representative.

1.9 WARRANTY

A. General Description: In addition to manufacturer's warranties, warrant Work for a period of one year from date of notice of Final Completion against defects in materials and workmanship.

B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship and trench backfill settlement.

C. Exceptions: Contractor shall not be held responsible for failures due to ordinary wear, abuse or neglect by Others, vandalism and other causes outside the Contractor's control.

PART 2 — PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

A. Plastic Catch Basins and Atrium Drain Grates:

1. National Diversified Sales (NDS), Camarillo, CA.

2. Carson Industries, Glendora, CA.

3. Or accepted substitute.

B. Geotextile Fabric:

1. Carthage Mills, Cincinnati, OH.

2. SI Geosolutions, Chattanooga, TN.

3. Or accepted substitute.

C. Corrugated Perforated Pipe and Corrugated Solid Pipe:

1. Advanced Drainage Systems, Inc., Columbus, OH.

2. Hancor Inc., Findlay, OH.

3. Or accepted substitute.

D. Flexible Couplings:

1. Fernco, Inc., West Sparks, NV.

2. Mission Rubber Company, Corona, CA.

3. Or accepted substitute.

E. Drain Mat Installed Horizontally: Vespro, Inc., San Raphael, CA; (800) 554-0914; www.vesproinc.com.

F. Cast Iron Catch Basin Grates and Frames: Neenah Foundry Company, Neenah, WI; (920) 725-7000; www.nfco.com.

G. Bronze Area Drain Grates – 4-inch and 6-inch: National Diversified Sales (NDS), Camarillo, CA (877) 301-5242.

H. Miter Drains: Mitered Drain Inc., www.mitereddrain.com, (707) 620-0606.

2.2 MATERIALS

A. Solid Pipe: PVC with rubber ring joints, SDR 35; ASTM D 3034 for 4-15 inches diameter pipe; ASTM F 679 for 18-27 inches diameter pipe.

B. Solid Pipe Fittings: PVC, ASTM D 3034.

C. Perforated Pipe: ASTM D 3350 Cell Classification 324420C or ASTM D 1248 Type III, Class C, Category 4, Grade P33; double-wall, corrugated, HDPE, smooth-interior wall, 6-inch diameter.

D. Perforated Pipe Fittings: PVC, ASTM D 3034 manufactured by solid pipe manufacturer.

E. Geotextile Fabric to Wrap Subdrain Pipe Drain Rock, to Underlay Aggregate Mulch, to Cover Tree Pit Dry Well Drain Rock and to Cover Drain Mat: Carthage 30 Percent; SI Geosolutions Geotex 117F; or accepted substitute.

F. Drain Rock Around Perforated Pipes: Washed, crushed, hard rock, 5/16-inch by number 8 size.

G. Clean-out for Planting Areas PVC; Schedule 80 female adaptor with brass male pipe thread plug.

H. Granular Soil Backfill for Solid Pipe Trenches: On-site soil, free of vegetative matter, debris, frozen materials, stones larger than 1-inch diameter, and sharp or hard material which could damage pipe or decay and cause settlement.

I. Sand Backfill for Solid Pipe Trenches and Perforated Pipe Trenches: Durable particles, free of thin or elongated pieces, lumps of clay, soil, loam or vegetable matter, with the following particle size gradation:

Sieve Size (Square)	*Percent Passing*
4	100
16	80 – 100
50	20 – 60
100	10 – 40
200	0 – 10

J. Granular Embedment: Free flowing sandy material which contains no clay, free of organic material, with the following size gradation:

Sieve Size	*Percent Retained*
2 inch	0
1 inch	0 – 10
40 inch	0 – 40
100 inch	95 minimum

K. Flexible Coupling: Heavy-duty 3/8-inch thick, minimum 5 inches long, flexible PVC with stainless-steel clamps designed and manufactured specifically to connect corrugated polyethylene pipe to PVC pipe.

L. Twelve-Inch Plastic Catch Basins: NDS 12-inch by 12-inch basin, NDS 1200 Series, black color with NDS 12-inch by 12-inch cast iron grate. Use NDS Universal outlet plugs and reducer rings to connect pipes to catch basins.

M. Nine-Inch Plastic Catch Basins: NDS 9-inch by 9-inch basin, NDS 900 series, black color, with 9-inch by 9-inch cast-iron grate at lawn areas and black color atrium grate at ground cover areas. Use NDS Universal outlet plugs and reducer rings to connect pipes to catch basins.

N. Cast Iron Catch Basin Grates and Frames at Swale Along Entry Drive: Neenah R-3437.

O. Adhesive for Anchoring Threaded Rods in Concrete: Refer to Section 05505.

P. Drain Rock for Tree Pit Dry Wells: Washed, crushed, hard rock, 3/4-inch to 1-inch diameter.

Q. Brass Drain Grates in Paving: Urban Accessories 6 inch square standard ADA grate, cast in ASTM B584 grade silicon bronze with number four brush finish.

R. Grate Frames for Drain Grates in Cobblestone Paving and Grid Reinforced Lawn Areas: Urban Accessories 8 inch square ASTM B584 grade silicon bronze NDS 900 adaptor frame.

S. Drain Mat: Versicell 500mm x 500mm x 20mm.

T. Trench Drain Grate and Custom Frame: Urban Accessories 6-inch wide ASTM B584 grade silicon bronze with number four brush finish.

U. Miter Drains: Mitered Drain Inc., 4MD3P-B.

PART 3 — EXECUTION

3.1 PREPARATION

A. Protection:

1. Use every possible precaution to prevent damage to existing conditions to remain.

2. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.

3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.

4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.

5. Submit written notification of conditions damaged during construction to the Owner's Representative within one working day of observed damage and before damage is covered.

3.2 TRENCH EXCAVATION

A. Excavation:

1. Pile materials suitable for back-filling a sufficient distance from banks of trenches to prevent slides or cave-ins.

2. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods.

3. Excavate width of the trench to provide adequate space for workers to place and joint the pipe or culvert properly, but hold the clear space between the barrel of the pipe and trench wall to the minimum required for a satisfactory installation.

4. Excavate trench to width necessary for sheeting and bracing and proper performance of the Work.

5. Accurately grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length, except for portions of pipe sections where it is necessary to excavate for bell holes and for proper making of pipe joints.

6. Dig depressions for joints after trench bottom has been graded and only 1/2-inch greater length, depth and width than the bell, as required for properly making the particular type of joint, and to insure that the bell does not bear on the bottom of the hole.

7. Over-cut with sand cushion may also be employed for pipe at Contractor’s option.

8. Pile excavated material on one side only of trenches to permit ready access to and use of existing fire hydrants, valves, manholes and other utilities system appurtenances.

9. Remove and dispose of excavated materials not required or satisfactory for backfill.

10. Keep surface drainage of adjoining areas unobstructed.

11. Remove water by pumping or other accepted method and discharge at a safe distance from the excavation.

B. Unsatisfactory Fill:

1. When fill incapable of properly supporting pipe is encountered in bottom of trench, notify the Owner’s Representative in writing.

2. Upon acceptance, remove unsatisfactory fill to depth accepted by the Owner’s Representative.

3. Backfill over-depths with material accepted by the Owner’s Representative at no additional cost to the Owner.

4. Compact over-depth fill material to 95 percent relative density as determined by ASTM D 1557.

3.3 PIPE INSTALLATION

A. Manufacturer's Requirements: Conform to the installation requirements of the pipe manufacturer's current printed instructions.

B. Pipe Laying:

1. Furnish and place in position necessary batter boards, string lines, plummets, graduated poles, etc., required in establishing and maintaining the lines and grades.

2. Protect batter boards and location stakes from possible damage or change of location.

3. Begin laying of the pipe on the prepared foundation at the outlet or downstream end with the spigot or tongue end of the pipe joint pointing downstream and proceed toward the inlet or upstream end with each abutting section of pipe properly matched, true to the established lines and grades.

4. Provide acceptable equipment for hoisting and lowering the sections of pipe into the trench without disturbing the prepared bedding foundation or the sides of the trench.

5. Clean ends of the pipe carefully before the pipe is placed in the trench.

6. As each length of pipe is laid, protect openings to prevent the entrance of earth or bedding material.

7. Fit and match pipe so that when laid in the prepared bedding it will form a smooth, uniform conduit.

C. Jointing:

1. Connect perforated pipes to solid PVC pipe with flexible couplings.

2. Install 6-inch long segments of pipe in PVC fittings and connect perforated pipe to 6-inch PVC pipe segments with flexible couplings.

3. Connect subdrain lines to existing PVC storm drain lines installed under Section 02630 using a PVC smooth saddle wye fitting, a wye fitting, or tee fittings.

4. Meet requirements of fitting, flexible coupling and pipe manufacturer's current printed instructions for installing fittings and couplings.

3.4 SUBDRAIN INSTALLATION

A. Drain Rock Covered With Geotextile Fabric:

1. Excavate trench as indicated on Drawings.

2. Tack 2 strips of geotextile fabric on trench walls.

3. Install drain rock.

4. Cover drain rock and overlap fabric ends 12 inches minimum.

3.5 TRENCH BACK-FILLING

A. General Backfill Over Solid Pipe:

1. Coordinate backfilling with testing of utilities.

2. Where damage is likely to result from withdrawing, leave shoring in place and cut off a minimum of 24 inches below finished grade.

3. Carefully backfill trenches with granular soil backfill and deposit in 9-inch maximum layers, loose depth.

4. Bring up granular soil backfill material evenly on both sides of pipe for its full length and thoroughly and carefully compact until pipe has a cover of not less than 1 foot.

5. Reopen trenches and excavation pits improperly backfilled, or where settlement occurs, to the depth required to obtain the specified compaction, then refill and compact, and restore the surface to the specified grade and compaction.

B. Backfill Under Paving Over Solid Pipe:

1. Backfill as specified above for general backfill, except backfill remainder of trench above the granular soil backfill material with field sand in 6 inch maximum layers, and moisten each layer and compact to 95 percent relative compaction as determined by ASTM D 1557.

2. Backfill to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

C. Backfill in Planting Areas Over Solid Pipe:

1. Backfill as specified above for general backfill except bring granular soil backfill up to finished subgrade surface level.

2. Compact granular soil backfill to a maximum 75-80 percent relative compaction as determined by ASTM D 1557.

3. Backfill top 6 inches of trenches with topsoil backfill.

4. Settle topsoil by sprinkling with minimum 2 inches of water.

5. Do not compact topsoil.

D. Backfill in Planting Areas Over Perforated Subdrain Pipe:

1. Backfill with drain rock and soil as indicated on Drawings.

2. Apply water to settle backfill.

3. Do not compact more than 75-80 percent relative compaction as determined by ASTM D 1557.

E. Settlement: If settlement occurs, fill depressions with topsoil, followed by raising plants and mulch or reseeding as required to repair settled planting areas to the original accepted condition.

3.6 CATCH BASINS

A. Plastic Catch Basins: Install as indicated on Drawings.

B. Cast Iron Grates and Frames:

1. Install as indicated on the Drawings.

2. Anchor each frame to top of each concrete structure with threaded rods.

3. Drill holes in concrete to diameter recommended by adhesive manufacturer.

4. Anchor threaded rods in drilled holes with adhesive.

3.7 PROTECTION

A. Pipe Lines: Protect from excessive loads until date of notice of Final Completion.

B. Drain Grates: Protect from excessive loads until date of notice of Final Completion.

END OF SECTION

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SECTION 321500
AGGREGATE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

1. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete exterior Aggregate Surfacing installation, as shown in the Contract Drawings, and as specified herein this Section.
2. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   a. Aggregate Surfacing Materials.
   b. Weed Control Barrier/Geotextile Filter Fabric.
   c. Miscellaneous Materials (Herbicides, etc.).
3. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   a. Section 32 91 13 – Soil Preparation.
   b. Section 32 93 00 – Exterior Plants.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

1. References:
   a. ASTM – American Society for Testing and Materials.
   b. ANSI – American National Standards Institute.
2. Definitions:
   a. psi – pounds per square inch (measurement).
   b. cu/ft – cubic-feet/foot (measurement).
   c. oc – on-center (measurement).

1.3 SUBMITTALS

1. General: Submit each item in this Article in four (4) bound Submittal Booklets, and four (4) sets of Material Samples for review by the Landscape Architect.

2. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified and legible (through yellow highlighter or other specific identification methods) information indicated herein this Article.
3. Product/Material Data. Submit available product/material literature (including color charts) supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.
4. Material Samples: For each type of material specified herein, provide Material Samples for review by the Landscape Architect. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled plastic bags (as applicable):
   a. 0.50 cu/ft of Aggregate Surfacing Material (i.e. Aggregates, Boulders, Cobbles, Rubble, etc.) for each color and texture of material required for Project.
   b. One (1) two-foot (2'-0") square sample of Weed Control Barrier/Geotextile Filter Fabric.
5. Scaled Shop Drawings: Not Required.
6. Field-Constructed Mock-ups: Not Required.
7. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.
8. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested. Partial Submittals will not be accepted.
9. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE AND CONTROL

1. Installer Qualifications:
   a. Requirement: Valid Texas (Landscape or General Contractor) License.
   b. Engage an experienced Installer who has completed Aggregate Surfacing work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.

c. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

2. Observation: Landscape Architect may observe installation of Aggregate Surfacing at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Aggregate Surfacing for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Aggregate Surfacing immediately from Project site.
3. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing services, and inspections necessary to perform and complete Work under this Section.
4. Single-Source Responsibility: Obtain each color, type, and variety of products/materials from a single source with resources to provide products/materials of consistent quality in appearance and physical properties without delaying Work.

1.5 DELIVERY, STORAGE, AND HANDLING

1. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. Deliver and store perishable material in original, unopened packaging.
2. Damaged Materials: Be responsible for all damage or disfiguration of Work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected materials.
3. Deliver materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

1. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
2. Excavation: When conditions detrimental to installing Aggregate Surfacing are encountered, such as adverse drainage conditions or obstructions, cease installation operations and notify Landscape Architect for further direction.

3. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
4. Installation: Perform installation of Aggregate Surfacing only when weather and soil conditions are suitable in accordance with locally accepted practices.
5. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 SUBSTITUTIONS

1. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.
2. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.
3. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.
4. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.8 LANDSCAPE ESTABLISHMENT PERIOD

1. Refer to Section 32 01 90 – Landscape Maintenance Period, for requirements under this Article.

PART 2 - PRODUCTS

2.1 AGGREGATE SURFACING MATERIALS

1. Aggregate Surfacing Materials:
   a. General: Hard, durable aggregates, washed free of loam, sand, clay, and other foreign substances or debris.
   b. Quantity: Provide and install in quantity required to provide acceptable depth and coverage as indicated on the Contract Drawings.
      1) Provide an adequate amount of Aggregate Surfacing material between Cobble, Rubble, and/or Boulder voids, as applicable.
   c. Material: Match approved referee sample, as acquired by the Landscape Architect, to compare for material, color, texture, size, and other characteristics relating to aesthetic effects.
      1) Type: See Drawings.
      2) Size: See Drawings.

2.2 WEED CONTROL BARRIER/GEO-TEXTILE FILTER FABRIC

1. Type: Permeable, lightweight, continuous, non-woven, geo-textile polypropylene filament material, UV-resistant, engineered to allow water permeability and deter soil permittivity, per ASTM D4491. Geo-Textile Filter Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. Meet AASHTO M288-96, Class 1.
2. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *Amoco 4553,* Amoco Fabrics and Fibers Company.
   b. *FX-80HS,* Carthage Mills.
   c. *C-80NW,* Contech.
   d. *180 EX,* Linq.
   e. *Geotex 801,* Propex, Inc.

f. *TerraTex N08,* Webtec.

g. *180N*, TC Mirafi.

h. *3301,* Typar Landscape Products.

i. or equal, as approved by the Landscape Architect.

2.3 EDGING / HEADERS

1. Steel Edging/Header:

a. General: Steel Edging/Header shall be in the location and size as shown on the Contract Drawings. Comply with ASTM A569, hot-rolled, standard flexible carbon steel edging, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately thirty inches (30") apart to receive stakes. Steel Edging/Header shall be double-staked at overlap joints, and designed to receive tapered steel stakes.

1) Size: 1/4" thick, 5" wide, by 16'-0" length, with seven (7) stakes per 16' section.

2) Color/Finish: Factory-applied Sherwin Williams H68GT85 powder coat paint, electrostatically applied and oven baked. Minimum thickness to be 1.5 mils.

1) COLOR: BLACK.

b. Steel Edging/Header Stakes: Steel, tapered, 15-16" minimum length, finish to match specified Steel Edging/Header. Stakes designed specifically to anchor Steel Edging/Header in place, and manufactured by manufacturer of the Steel Edging/Header for which they will be used.

c. Accessories: Standard tapered ends, corners, and splices, as required.

d. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:

1) Ryerson & Son, Emeryville, CA.

2) *DuraEdge*®, J.D. Russell Co., Tucson, AZ.

3) *Border King*™ (for ¼" thick stock), Border Concepts, Inc., Charlotte, NC.

4) *Border-Guard*™ (for 3/16" thick stock), Border Concepts, Inc., Charlotte, NC.

5) Or equal, as approved by the Landscape Architect.

2.4 MISCELLANEOUS MATERIALS

1. Herbicides: EPA registered and approved, from the following:

a. Non-Selective Post-Emergent Herbicide: Spray-applied solution containing a minimum of 41% of the active ingredient “glyphosate” (full strength), with a surfactant, mixed with water accordingly per the Manufacturer’s directions.
   1) Products & Manufacturer’s: Subject to compliance with requirements, provide products by one (1) of the following:
      1) *Roundup® PRO*, (41% glyphosate), Monsanto Company, St. Louis, MO.
      2) *Roundup® PRO* Concentrate (50% glyphosate), Monsanto Company, St. Louis, MO.
      3) *Honcho® Plus,* (41% glyphosate), Monsanto Company, St. Louis, MO.
      4) *High Yield® Kill-Zall Weed & Grass Killer,* (41% glyphosate),Voluntary Purchasing Groups, Boneham, TX.
      5) or equal, as approved by the Landscape Architect.
   2) Application Rate: Provide at prescribed rate and application per Manufacturer’s written recommendations, per one-hundred (100) gallons of water.

b. Selective Pre-Emergent Herbicide (Packaged dry material application): Pre-emergent control of annual grasses and broadleaf weeds in turf grass areas, and woody ornamental trees, shrubs, vines, and groundcover areas. Product to contain the active ingredient “trifluralin”.
   1) Products & Manufacturer’s: Subject to compliance with requirements, provide products by one (1) of the following:
      1) *Ronstar® 2G*, (granular), Aventis Environmental Science USA.
      2) *Snapshot® 2.5 GT* (granular), (2% trifluralin), Dow AgroSciences LLC.
      3) *Treflan® HFP* (43% trifluralin), Dow AgroSciences LLC.
      4) *Treflan® TR-10,* (10% Granular trifluralin), Dow AgroSciences LLC.
      5) *Surflan®,* Dow AgroSciences, LLC.
      6) or equal, as approved by the Landscape Architect.
   2) Application Rate: Provide at prescribed rate and application per Manufacturer’s written recommendations, per one-hundred (100) gallons of water.

c. Selective Post Emergent Herbicide: Pre-mixed, flow-able formulation designed for product stability, uniformity in the spray solution and ease of handling. Post-

emergent control of annual grasses, nutsedge, and broadleaf weeds in turf, generally with one (1) application.

1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   1) *Trimec® Plus Post-Emergent Grass and Broadleaf Herbicide*, PBI/Gordon, Co.
   2) *Ornamec® 170 Grass Herbicide*, PBI/Gordon, Co.
   3) or equal, as approved by the Landscape Architect.
2) Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

PART 3 - EXECUTION

3.1 GENERAL

1. Installation practices of the Aggregate Surfacing shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practice, as approved by the Landscape Architect. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.
2. Examination: Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of Work of this Section. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL ALL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED AND APPROVED, IN WRITING. DO NOT PROCEED WITH INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
3. Prior to Work in this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and as required, to the point where the installation of the Landscape Planting Accessories may commence properly.

3.2 PROTECTION OF SITE

1. Contractor shall protect existing and new improvements and systems installed prior to installation of Aggregate Surfacing. Maintain protection in place until completion of Work and Landscape Establishment Period.

3.3 INSTALLATION OF MISCELLANEOUS MATERIALS

1. Herbicides: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions, prior to the installation of the Aggregate Surfacing material.

3.4 INSTALLATION OF AGGREGATE SURFACING MATERIALS

1. General: Backfill surfaces of pits, trenches, planted areas, and other areas indicated to appropriate finished grades.
2. Aggregate Surfacing:
   a. Aggregate Surfacing consists of loose aggregate material placed on a layer of Geotextile Filter Fabric which is pinned to the compacted surface of the sub grade. Apply Aggregate Surfacing in the specified areas on the Contract Drawings, with the finished grade of the Aggregate Surfacing level with adjacent finished surfaces.
      1) Geotextile Filter Fabric: Install Fabric according to the Manufacturer's recommendations over compacted sub grade and prior to placement of Aggregate Surfacing. Completely cover mulched area, lapping Fabric edges a minimum of six-inches (6"). Tack/pin into place using steel staples, set at thirty-six-inches (36") O.C. maximum along perimeter.
      2) Spread Aggregate Surfacing evenly throughout all areas designated to receive the Aggregate Surfacing at the following thickness and rates:
         1) THICKNESS: Minimum two-inches (3") thick. Depth of Aggregate Surfacing shall be adequate to thoroughly cover the Geotextile Filter Fabric.
         2) THICKNESS: Minimum three-inches (4") thick. Depth of Aggregate Surfacing shall be adequate to thoroughly cover the Geotextile Filter Fabric.
   b. Protect Plant Materials during installation of Aggregate Surfacing; do not place Aggregate Surfacing against the trunks or stems of plants. Remove Aggregate

Surfacing that is placed against the growing bases or within the basal nodes of the plants.

c. Plant Materials that are damaged during this operation, at the sole opinion of the Landscape Architect, shall be replaced accordingly at the Contractor's expense.
   1) Seeding between voids of Boulders, Cobble and/or Rubble: Provide an adequate quantity of Aggregate Surfacing, in the specified type(s), as required, to thoroughly cover and fill in the voids, nooks, and crannies between and adjacent to all Boulders, Cobbles, and/or Rubble placed in landscaped areas, to the satisfaction of the Landscape Architect.

d. Replace Aggregate Surfacing that is unlike in character (color, size, texture). Defective, fractured, stained, or material which does not meet the requirements herein in this Section shall be removed and replaced with appropriate Aggregate Surfacing material as specified.

e. Rake Aggregate Surfacing surfaces smooth, consistent, and level, with no depressions, voids, rills, footprints, etc. Fines from the Aggregate Surfacing that are located on the finished surface shall be raked and/or removed accordingly to establish a clean, consistent Aggregate Surfacing finish.

f. Maintain Aggregate Surfacing free of stains, weeds, discoloration, trash, fines, debris, soil, sand, or other foreign material.
   1) Contractor shall exercise care so as not to contaminate Aggregate Surfacing with Shredded Wood Mulches, plant materials, soil, or other foreign substances.
   2) Soil that has contaminated the Aggregate Surfacing areas shall be removed from the Aggregate Surfacing. Raking to "hide" the soil below the finished surface of the Aggregate Surfacing is not acceptable.

3.5 CLEAN UP AND PROTECTION

1. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.
2. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and

Landscape Establishment Period. Treat, repair, or replace damaged Aggregate Surfacing as directed.

3. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section and directed by the Landscape Architect.

3.6 FINAL REVIEW

1. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. (Refer to Section 329813 – Landscape Establishment Period for requirements).

END OF SECTION 321500

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SECTION 32 3119

DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Decorative steel fences.

B. Automatic gate operators.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

1.3 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

C. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2019).

D. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.

E. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2020.

F. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016 (Reapproved 2023).

G. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2018.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

L. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Design Calculations: For high wind load areas, provide calculations for fence panels and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings:
1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
2. Foundation details, concrete design mix and reinforcing schedule for anti-ram barrier system.

E. Samples: Submit two samples of fence panels, 18 inch by 18 inch in size illustrating construction and colored finish.

F. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates.

G. Installer's Qualification Statement.

H. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

I. Manufacturer's Warranty.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Decorative Metal Fences and Gates:
1. Ameristar Perimeter Security, USA: www.ameristarperimeter.com.
2. CDH Custom Roll Form, LLC; Palisade Security Fence: www.cdhrollform.com.
3. Knotwood, a brand of OmniMax International: www.knotwood.com.
4. Patriot Custom Metals DBA PalmSHIELD: www.palmshieldlouvers.com.
5. Stewart Iron Works, LLC: www.stewartironworks.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Automatic Gate Operators:
   1. Tymetal Corp; www.tymetal.com/#sle.

C. Specialty Hardware:
   1. DAC Industries, Inc; Detex Exit Bar: www.dacindustries.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
   1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils (0.058 mm), minimum.
   2. Color: As selected by Architect from manufacturer's standard range.
   3. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Impact Resistance: ASTM D2794; 60 inch pounds (6.8 N m).

C. Steel: ASTM A653/A653M; tensile strength 45,000 psi (310 MPa), minimum.
   3. Hot-dip galvanized; ASTM A653/A653M, G60.
   4. 62 percent recycled steel, minimum.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Tamper-proof security bolts.
   2. Self-drilling hex-head screws.

E. Hinges: Finished to match fence components.

F. Latches: Finished to match fence components.

2.3 WELDED STEEL FENCE

A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.

B. Fence Panels: Fusion welded; 8 feet (2.4 m) high by 6 feet (1.8 m) long.
   1. Panel Style: Two rail.
   2. Attach panels to posts with manufacturer's standard panel brackets.

C. Posts: Steel tube.
   3. Size: 3 inches (76 mm) square by 12 gauge, 0.109 inch (2.76 mm thick), with manufacturer's standard cap.

D. Rails: Manufacturer's standard, double-wall steel channel 1-3/4 inch (44.5 mm) square by 12 gauge, 0.1094 inch (2.76 mm thick) with prepunched picket holes.
   1. Picket Retaining Rods: 0.125 inch (3.17 mm) galvanized steel.
   2. Picket-to-Rail Intersection Seals: PVC grommets.

E. Pickets: Steel tube.
   1. Spacing: 3-3/4 inch (95.2 mm) clear.
   2. Size: 1 inch (25.4 mm) square by 18 gauge, 0.0478 inch (1.21 mm thick).
   3. Style: Pickets with finial extend above top rail.
   4. Finial: Spear point.

F. Rolling Gates: Same construction as fence.

G. Flexibility: Capable of following variable slope of up to 1:2.

H. Color: Black.

2.4 SPECIALITY HARDWARE

A. Rollers: Finished to match fence components.
   1. Load Rating: 500 pounds (227 kg).
   2. Groove: Flat.
   3. Material: Steel.

2.5 AUTOMATIC GATE OPERATORS

A. Sliding Gates: Prewired, pedestal-mounted gate operator for horizontal sliding gates, per ASTM F2200 and UL 325.
   1. Operating type: Drive belt.
   2. Control Functions: Open, Pause, Close.
   3. Maximum Open/Close Time: 10 seconds.
   4. Access: Card.
   5. Maximum gate weight: 500 pounds (187 kilograms).
   6. Horsepower Rating: Suitable for connected load.
   7. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
   8. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
      a. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2.6 ACCESSORIES

A. Keypad Mounting Supports: Where not factory installed, provide mounting supports for keypad installation.
   1. Products:
      a. StrongPoles, LLC; Architectural Keypad Pedestal: www.strongpoles.com/#sle.

B. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

C. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. When cutting rails immediately seal the exposed surfaces by:

1. Removing metal shavings from cut area.
2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
3. Apply two coats of custom finish spray paint matching fence color.
4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.

E. Excavate post holes in accordance with Section 312316.

F. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6.3 mm).

B. Maximum Offset From Indicated Position: 1 inch (25.4 mm).

C. Minimum Distance from Property Line: 6 inches (152 mm).

3.5 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

C. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

D. Gates: Inspect for level, plumb, and alignment.

E. Workmanship: Verify neat installation free of defects.

3.6 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.

3.8 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Concrete.

D. Manual gates with related hardware.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete anchorage for posts.

B. Section 08 7100 - Door Hardware: Gate locking device.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric 2011a (Reapproved 2022).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

E. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a (Reapproved 2019).

F. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework 2018 (Reapproved 2022).

G. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures 2018 (Reapproved 2022).

H. CLFMI CLF-FIG0111 - Field Inspection Guide 2014.

I. CLFMI CLF-SFR0111 - Security Fencing Recommendations 2014.

J. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric) 1990.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

D. Manufacturer's Qualification Statement.

E. Fence Installer Qualification Statement.

F. Field Inspection Records: Provide installation inspection records that include post settings, framework, fabric, barbed wire, fittings and accessories, gates, and workmanship.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Line Posts: 2.875” OD steel pipe, 5.79 lbs/lf or 2.25” x 1.875” H-sections, 3.26 lbs/lf.

B. End, Corner and Pull Posts: 2.875” OD steel pipe, 5.79 lbs/lf or 3.5” x 3.5 roll-formed sections, 4.85 lbs/lf.

C. Gate Posts: Furnish posts for supporting single leaf gate, or one leaf of a double gate installation, for nominal gate widths as follows:

Leaf Width	Gate Post	Lbs/lf
Up to 6’	3.5” x 3.5” roll-formed section or 2.875” OD pipe	4.85 5.79
Over 6’ to 13’	4.0” OD pipe	9.11
Over 13’ to 18’	6.625” OD pipe	18.97
Over 18’	8.625” OD pipe	28.55

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.

F. Gate Frame: 1.66 inch diameter for welded fabrication.

G. Fabric: 2 inch diamond mesh interwoven wire, 9 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

H. Fabric with Pre-Inserted Slats: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
   1. Privacy Slats: High-density polyethylene (HDPE), woven into fabric.
      a. Visual Barrier: 95 percent.
      b. Slat Color: As selected by Architect.

I. Tension Wire: 7 gauge, coated coil spring wire, metal and finish to match fabric. Locate at top and bottom.

J. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16”x3/4”. Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into post.

K. Stretcher Bar Bands: Space not over 15” O.C. to secure stretcher bars to end, corner, pull, and gate posts.

L. Lock Boxes for Detention Locks: 10 gage galvanized steel box and cover plate as required to accommodate detention locks at gates.

M. Provide base plates on posts where indicated on the drawings anchored to concrete slabs with expansion bolts where applicable.

N. Tie Wire: Aluminum alloy steel wire.

2.2 MATERIALS

A. Posts, Rails, and Frames:
   1. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi (345 MPa); zinc coating complying with ASTM F1043 and ASTM F1083.
   2. Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, HSLAS, Grade 50, with G90 (Z275) zinc coating.
   3. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   4. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric:
   1. ASTM A392 zinc coated steel chain link fabric.

C. Concrete:
   1. Type specified in Section 03 3000.

2.3 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

2.4 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.5 FINISHES

A. Components: Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.2 PREPARATION

A. Removal: Obstructions or debris.

3.3 INSTALLATION

A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undistributed or compacted soil.
   1. If not indicated on drawings, excavate holes for each post to minimum diameters as recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
   2. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

C. Setting Posts: Center and align posts in holes 3" above bottom of excavation.
   1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
   2. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.

D. Top Rails: Run rail continuously through post caps, bending to radius for curbed runs. Provide expansion couplings as recommended by fencing manufacturer.

E. Bottom Rails: Run rail continuous between posts, bending to radius for curved runs. Provide top rail brackets capable of supporting 3 strands barbed wire – angle brackets inward to property.

F. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.

H. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released. Fencing fabric to be 8'-0" high.

I. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure posts with metal bands spaced 15" o.c.

J. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

K. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Direct twisted tie ends away from the secure side of the fencing. Tie fabric to line posts, with steel wire ties spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with steel hog rings spaced 24" o.c.

L. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Do not infringe on adjacent property lines.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.6 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 32 84 00
PLANTING IRRIGATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping.
2. Manual valves.
3. Automatic control valves.
4. Automatic drain valves.
5. Quick couplers.
6. Controllers.
7. Boxes for automatic control valves.

1.2 PERFORMANCE REQUIREMENTS

A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Intent of Drawings: Sprinkler lines shown on the Drawings are diagrammatic. Locations of all sprinkler heads, valves, piping, wiring, etc. shall be established by the Contractor at the time of construction. Spacing of sprinkler heads and quick coupling valves are shown on the Drawings and shall be exceeded only with the permission of the Owner's authorized representative.

C. Keep all areas of work clean, neat, and orderly at all times. Keep paved areas clean during installation operations.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For irrigation systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Zoning Chart: Show each irrigation zone and its control valve.

E. Controller Timing Schedule: Indicate timing settings for each automatic controller zone.

F. Field quality-control reports.

G. Operation and maintenance data for the following:

1. Irrigation controller.
2. Valves and gate valves.
3. Pipe and fittings.
4. Valve boxes.
5. Quick coupling valves.
6. Low voltage wire and connections.

H. Record Irrigation Drawings:

1. Furnish Record Drawings of complete irrigation system in accordance with the General and Special Conditions.
2. Procure full size set of Contract Drawings from Landscape Architect.

a. Construction Drawings shall be on-site at all times while irrigation system is under construction.
b. Make daily record of all work installed each day.
c. Actual location of valves and quick couplers and all irrigation and drainage piping shall be shown on prints by dimensions from easily identifiable permanent features, such as buildings, curbs, fences, walks, or property lines.
d. Drawings shall show approved substitutions of material. Include material, manufacturer's name, and catalogue number.
e. Drawings shall be to scale and all indications shall be easily understandable, legible, and neat.

1.4 QUALITY ASSURANCE

A. Requirement of Regulatory Agencies:

1. All work and materials shall be in full accordance with the latest rules and regulations of safety orders of Division of Industrial Safety; the Uniform Plumbing Code and other applicable laws or regulations, including the City of Houston.
2. Nothing in Drawing is to be construed to permit work not conforming to these codes. Should the Contract Documents be at variance with the aforementioned rules and regulations, notify Landscape Architect and get instructions before proceeding with the work.

B. Testing:

1. Preliminary review of completed installation will be made by the Landscape Architect prior to backfilling trenches and during hydrostatic testing.

2. Final review shall be made in conjunction with the final review, shrubs, and tree planting.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 FINAL ACCEPTANCE

A. Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work. Upon final acceptance, Owner will assume responsibility for maintenance of the work. Said assumption does not relieve Contractor of obligations under Warranty.

1.6 WARRANTY

A. In addition to the manufacturer's guarantees or warrantees, all work shall be warranted for one year from the date of Final Acceptance against defects, material, equipment and workmanship by the Contractor. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defect in materials, equipment, and workmanship to the satisfaction of the Owner.

B. Contractor shall not be held responsible for failures due to neglect by the Owner, vandalism, etc., during the Warranty or Guarantee period. Report such conditions to the Landscape Architect in writing.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials throughout the system shall be as specified and noted on the Drawings, new and in perfect condition.

B. Gate Valves: Three inches in size and under, 125 pound bronze construction, non-rising stem type, sized to line. NIBCO #T113 or approved equal.

C. Sleeves: Control wire and water line sleeves shall be PVC 1120-1220, Schedule 40 pipe.

D. Irrigation Controllers: As shown on Drawings.

E. Control Wiring: Solid copper, UL approved for direct burial in ground. Minimum gage#14 UF (#12 UF for runs over 1,000 LF). Common ground wire shall be white.

F. Valve Boxes: Injection molded of polymers and fibrous inorganic temperature resistant components. Box shall provide adequate clearance to operate and service valve. Box and lid shall be black.

1. Acceptable Manufacturers: Amtek, Christy, Carson, or approved equal.
2. Valve boxes for remote control valves shall be rectangular, approximately 10-inch x 14-inch inside dimensions by 15 inches deep. Boxes shall be black with lockable lids and have painted on lid with 1-inch high white letters "RC".
3. Valve boxes for gate valves and quick couplers, shall be round, approximately 9-inch inside diameter by 10-inch deep. Boxes shall be black with lockable lids and have painted on lid with 1-inch high white letters "QC".

G. Quick Couplers:

1. Valve and keys as specified on Drawings.
2. Furnish two valve keys fitted with 3/4-inch swivel hose ells.

H. Conduit: All conduit for low voltage irrigation control wires shall be 2-inch Schedule 40 PVC. Control wiring may be placed in common sleeve with lateral or main lines under paving when sleeves are larger than 4-inches. Use galvanized steel pipe only under public roads or for high voltage power conductors.

2.2 PIPING

A. Piping on pressure side of irrigation control valves:

1. Two and one-half inch diameter and smaller – ASTM D 1785, PVC 1120-1220 compound, Schedule 40.

B. Piping on non-pressure side of irrigation control valves:

1. Two inch to three-quarter inch – ASTM D 1785, PVC 1120-1220, Class 200.
2. One-half inch and smaller – ASTM D 1785, PVC 1120-1220, Class 315.

C. Identification: Continuously and permanently marked with manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 degrees F., and National Sanitation Foundation (NSF) approval.

2.3 FITTINGS

A. Fittings for Solvent- Welded Pipe:

1. Schedule 40, polyvinyl chloride, standard weight, as manufactured by "Sloane", "Lasco", or approved equal, to meet ASTM D-2466-73 and D-2467-73.
2. Threaded PVC nipples - Schedule 80 PVC.

B. Fittings for Polyethylene Pipe:

1. Polyallomer as manufactured by "Flintkote" or approved equal.
2. Compression type of CPVC as manufactured by "Pepco".

C. Fittings for Swing Joints:

1. Supply three (3) Schedule 40 "Marlex" elbows.
2. Threaded PVC Nipples - Schedule 80 PVC.

2.4 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

1. Contractor shall be acquainted with all site conditions. Should utilities or other work not shown on the plans be found during excavations, Contractor shall promptly notify Landscape Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage arising from operations subsequent to discover of such utilities not shown on plans.
2. Contractor shall take necessary precautions to protect site conditions. Should damage be incurred Contractor shall repair damage to its original condition or furnish and install equal replacement.

3.2 LAYOUT

A. Consideration will not be given to design changes until after award of contract.

B. Lay out work as closely to that shown on the Contract Drawings as possible. Contract Drawings are diagrammatic in nature. Adjust layout as necessary to accommodate actual site conditions. Locate pipe and valves shown under paving in adjacent planting area.

C. Full and complete coverage is required. Contractor shall make minor adjustments to layout as required to assure full and complete coverage. When such adjustments require exceeding radius limitations shown on irrigation legend, contact Landscape Architect for direction.

D. Substitutions for smaller pipe sizes will be not be accepted.

3.3 PIPING INSTALLATION

A. General:

1. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.
2. Clean all pipes and fittings of dirt and moisture before assembly.
3. Install piping free of sags and bends.
4. Install groups of pipes parallel to each other, spaced to permit valve servicing.
5. Install fittings for changes in direction and branch connections.
6. Install unions adjacent to valves and to final connections to other components with NPS 2 (DN 50) or smaller pipe connection.
7. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 (DN 65) or larger pipe connection.
8. Install expansion loops in control-valve boxes for plastic piping.
9. Lay piping on solid subbase, uniformly sloped without humps or depressions.
10. Install ductile-iron piping according to AWWA C600.
11. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

B. Solvent-Welded Joints for PVC Pipes:

1. Use solvents and methods by pipe manufacturer
2. Cure joint a minimum of one hour before applying any external stress on the piping and at least twenty four (24) hours before placing the joint under water pressure.

C. Threaded Joints for Plastic Pipes:

1. Use Teflon tape on the threaded PVC fittings except where Marlex fittings are used.
2. Use strap-type friction wrench only. Do not use metal-jawed wrench.
3. When connection is plastic to metal, male adaptors shall be used. The male adaptor shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or approved equal.

D. Joints for Polyethylene Pipes:

1. Double-clamp all connections 1-1/4-inch diameter and greater.
2. Make all connections between polyethylene pipes and metal valves or pipes with threaded fittings using male adaptors.

E. Laying of Pipe:

1. Pipes shall be bedded in at least 2-inches of finely divided material with no rocks or clods over 1-inch diameter to provide a uniform bearing.
2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
3. Do not lay PVC pipe when there is water in the trench.
4. Install plastic pipe in a manner to provide for expansion and contraction as recommended by the manufacturer.

5. Cut plastic pipe with PVC pipe cutters or hacksaw to ensure a square cut. Remove burrs at cut ends prior to installation to ensure that a smooth unobstructed flow will be obtained.
6. All plastic to plastic joints shall be solvent-weld joints or slip seal joints. Only solvent recommended by the pipe manufacturer shall be used. Install plastic pipe and fittings as outlined and instructed by pipe manufacturer. It shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. Contractor shall assume full responsibility for the correct installation.

3.4 EQUIPMENT INSTALLATION

A. Gate Valves: Group valves together and locate in planted areas where possible. Box shall be flush with finish grade.

B. Irrigation Control Valves: Install control valves in valve boxes where shown and group together where practical. Place no closer than 12-inches to walk edges, buildings, and walls. Valve boxes shall be flush with finish grade.

C. Quick Coupling Valves: Install quick coupling valves on a swing joint assembly as detailed on the Drawings.

D. Automatic Controller:

1. Install per local code and manufacturer's latest printed instructions.
2. Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
3. Affix controller name (i.e. "Controller A") on inside of controller cabinet door with letters minimum of 1-inch high.
4. Affix a non-fading copy of irrigation diagram to cabinet door below controller name. Seal irrigation diagram between two sheets of 20 mil (minimum) plastic.
5. Irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the controller, showing station number, valve size, and type of planting irrigated.

E. Control Wiring:

1. Install control wires with sprinkler mains and laterals in common trenches wherever possible. Lay to the side of pipe line. Provide looped slack at valves and snake wires in trench to allow for contraction of wires. Tie wires in bundles at ten (10') foot intervals.
2. Crimp and seal control wire splices at remote control valves with specified splicing materials. Line splices will be allowed only on runs of more than 500 feet. Line splices to be Scotchlok and sealed with Scotchkote sealer.
3. Install a minimum of one (1) extra control wire to the control valve located the greatest distance from the controller in both directions and label each end blank or as shown on drawings.

F. Closing of Pipe and Flushing of Lines:

1. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
2. Thoroughly flush out all water lines before installing heads, valves and other hydrants.
3. Test as specified.
4. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution.
5. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the Drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas, shall be set to grade. Sprinkler heads which are to be installed in lawn areas where the turf has not yet been established shall be set 1-inch above the proposed finish grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. Such lowering of heads shall be done by Contractor as part of the original contract with no additional cost to the Owner.

3.5 BACKFILL AND COMPACTING:

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil free of debris.

B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 95 percent density under pavements, and 85 percent under planted areas.

C. Compact trenches in areas to be planted by thoroughly flooding backfill. Jetting process may be used in those areas.

D. Dress off all areas to finish grades.

3.6 GUARANTEE

A. The Contractor shall warrant all materials and workmanship for one (1) year from final acceptance.

3.7 CLEAN UP

A. Clean up and remove all debris from the entire work area prior to Final Acceptance to satisfaction of Landscape Architect.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Perform hydrostatic tests when welded PVC joints have cured per manufacturer's instructions.

1. Pressurized Mains:

a. Completely install mains, gate valves, and control valves. Do not install laterals.
b. Fill all lines with water.
c. Pressurize the main with air to 70 psi. Monitor gauge for pressure loss for four (4) hours. Maximum allowable loss over four (4) hour period - 3 psi.
d. Leave lines and fittings exposed throughout testing period.
e. Leaks resulting from tests shall be repaired and tests repeated until the system passes.
f. Test all gate valves for leakage.

2. Non-Pressure Laterals:

a. Test piping after laterals and risers are installed and system is fully operational.
b. Leave trenches open to detect possible leaks.

C. Submit written requests for inspections to the Landscape Architect at least forty eight (48) hours prior to anticipated inspection date.

D. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

1. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Any irrigation product will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.9 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

END OF SECTION

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SECTION 32 91 13
SOIL PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. In-Place Amendment of Planting Area Soil Surfaces.
2. Plant Pit Backfill Mix.

B. Related Sections:

1. Section 32 01 90, Landscape Maintenance Period.
2. Section 32 84 00, Planting Irrigation.
3. Section 32 92 00, Lawns & Grasses.
4. Section 32 93 00, Exterior Plants.

1.2 REFERENCES

A. ASTM — ASTM International: D 1557 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

B. USDA — United States Department of Agriculture:

1. Soil Texture Triangle Classification.
2. Handbook No. 60.

1.3 DEFINITIONS

A. Acceptance, Acceptable, or Accepted: Acceptance by the Landscape Architect in writing.

B. Excessive Compaction: Planting area soil compaction greater than 75 percent of maximum dry density as determined by ASTM D 1557.

C. Horticultural Consultant: Horticultural consultant employed by Landscape Architect for Project.

D. Landscape Architect: Landscape Architect employed by the Owner to provide

professional landscape architectural services for the Project.

E. Drip Line: Line straight down from outermost limit of tree canopy branching.

1.4 SYSTEM DESCRIPTION

A. Backfill Mixes and Amended Planting Area Surface Soil: Uncompacted on-site soil with amendments incorporated uniformly to provide a well-draining, fertile medium for vigorous plant root growth.

B. Soil Mixes: Uncompacted, imported topsoil with amendment incorporated uniformly to provide a well-draining, fertile medium for vigorous plant root growth.

1.5 SUBMITTALS

A. General Requirements: Refer to Division 1.

B. Product Data:

1. Chemical Amendments.
2. Organic Soil Conditioner.
3. Fertilizers.
4. Organic Amendment.

C. Test Reports:

1. Laboratory soil test reports indicating specified characteristics of soil, with test date no more than 2 weeks old.
2. Laboratory soil test reports.
3. Laboratory test report of organic amendment indicating specified characteristics of organic amendment, with test date no more than 2 weeks old.
4. Sieve analysis of sand for palm tree plant pit backfill mix.

D. Purchase Documentation:

1. Fertilizer Purchase and Delivery Invoices.
2. Chemical Amendment Purchase and Delivery Invoices.

1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.
2. Provide for inspections and permits required by federal, state and local

authorities in furnishing, transporting, and installing materials.

1.7 SITE CONDITIONS

A. Environmental Requirements:

1. Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clods will not break readily.
2. Apply water, if necessary, to bring soil to an optimum moisture content for tilling.
3. Do not work soil when muddy or frozen.
4. Do not apply chemicals if wind conditions will cause hazardous drift to people or property.

B. Existing Conditions:

1. Prior to Work commencement review and clearly mark in field horizontal and vertical locations of existing public underground utilities and structures with respective utility companies.
2. Prior to Work commencement review and clearly mark in field horizontal and vertical locations of existing private underground utilities and structures with the Owner's Designated Representative.

PART 2 PRODUCTS

1.1 SOIL

A. Site Soil:

1. Site soil used to form landscape planting areas or backfill planters shall be clean, fertile, loamy soil, free of stones, sticks, stumps, or other deleterious matter one inch in diameter or larger. It shall also be free from wire, plaster, construction debris, or similar objects that would be a hindrance to planting or maintenance.
2. Polymeric Soil Conditioner: Twenty to 25 percent anionic polyacrylamide, water-soluble, linear, 7,500,000- dalton, soil aggregating polymer containing a minimum of 20,000 soil binding sites proven to be efficacious.
3. The Architect shall approve suitability of soil of the site after reviewing results of the soil test.

B. Import Top Soil: See Finished Grading Section 32 91 16.

2.1 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

A. Fertilizers:

1. Roots, Inc., Independence, Mo.; (800) 342-6173; www.rootsinc.com.
2. Vermi Technology Unlimited, Orange Lake, Fla; (352) 591-1111; www.vermitechnology.com.
3. Kelly's Green Team, Newark, Mo.; (660) 627-5500; www.kellysgreenteam.com.

2.2 MATERIALS

A. Organic Amendment:

1. Humus material shall have an acid-soluble ash content of no less than 5 percent and no more than 20 percent.

2. The pH of the material shall be between 6 and 7.5.

3. The salt content shall be less than 10 millimho/cm at 25 degrees C on a saturated paste extract.

4. Boron content of the saturated extract shall be less than 1.0 part per million

5. Silicon content (acid-insoluble ash) shall be less than 50 percent.

6. Calcium carbonate shall not be present if the amendment is to be applied on alkaline soils.

7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses, etc., low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable (stable humus must be present). Wood-based products are not acceptable which are based on redwood or cedar.
9. Sludge-based materials are not acceptable.

10. Carbon-nitrogen ratio shall be less than 25:1.The compost shall be aerobic without malodorous presence of decomposition products.

11. The maximum particle size shall be 0.5-inch and 80 percent or more shall pass a No. 4 screen for mixing with soil. The maximum particle size for applying via hydroseeding machine shall be 0.25-inch.

12. Maximum total permissible pollutant concentrations in organic amendment in parts per million on a dry-weight

    basis:

Arsenic:	20

Cadmium:	15
Chromium:	300
Cobalt:	50
Copper:	150
Lead:	200
Mercury:	10
Molybdenum:	20
Nickel:	100
Selenium:	50
Silver:	10
Vanadium:	400
Zinc:	250

Higher amounts of salinity or boron may be present if the soils are to be pre-leached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

13. From 45- to 65-percent moisture measured via wet-weight basis.

14. Free of stones and debris.

15. Tests 5 to 8 on Solvita Test.

B. Fertilizers:

1. Roots “M-Roots” with mycorrhiza 3-3-3.

2. Kelley’s Green Team Gypsum Fairway Pellets, 76-percent calcium sulphate dehydrate, 17-percent calcium; 14- percent sulphur, derived from mined gypsum, less than 1-percent moisture content.
3. Vermi Technology pure black worm castings produced without waste products; free of larva, sticks, stones, and debris; 48 percent by weight minimum organic content per ASTM D2974; complying with the following:

Item	*Criteria*
Total Ash	48% to 52%
pH:	5.0 to 7.5
% Moisture (wet wt. basis:	30%
to 50% Solvita Rating:	> 8

C. Potential Chemical Amendments Required by Accepted Amendment Program and Backfill Mix:

1. Ground Limestone: Agricultural limestone containing not less than 85 percent of total carbonate, ground to such fineness that 50 percent will pass No. I sieve and 90 percent will pass No. 20 sieve.
2. Dolomite Lime: Agricultural grade mineral soil conditioner containing 35 percent minimum magnesium carbonate and 49 percent minimum calcium carbonate, 100 percent passing No. 65 sieve.

3. Gypsum: Agricultural grade product containing 80 percent minimum calcium sulfate.

4. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20 to 30 percent iron and 35 percent to 40 percent sulfur.
5. Sulfate of Potash: Agricultural grade containing 50 to 53 percent of water-soluble potash.

6. Single Superphosphate: Commercial product containing 20 to 25 percent available phosphoric acid.

7. Ammonium Sulfate: Commercial product containing approximately 21 percent ammonia.

8. Ammonium Nitrate: Commercial product containing approximately 34 percent ammonia.

9. Calcium Nitrate: Agricultural grade containing 15-1/2 percent nitrogen.

10. Urea Formaldehyde: Granular commercial product containing 38 percent nitrogen.

11. IBDU (Iso Butyldiene Diurea): Commercial product containing 31 percent nitrogen.

12. Soil Sulfur: Agricultural grade sulfur containing a minimum of 96 percent sulfur.

13. Silicic Acid Calcium: Commercial grade.

2.3 MIXES

A. Preliminary Plant Pit Backfill Mix to Establish Bid (actual quantities contingent on amendment program determined by the Landscape Architect and Horticultural Consultant based on soil test report):
   1. Content:
      a. 8 cubic feet of organic amendment per cubic yard of dry soil.

      b. 1-pound dry polymeric soil conditioner per cubic yard of dry soil.

      c. 2 pounds Iron Sulfate per cubic yard of dry soil.

      d. 1-pound granular Micromax per cubic yard of dry soil.

      e. 1/2-pound Triple Superphosphate 0-45-0 per cubic yard of dry soil.

      f. 1-pound of Nitroform 38-0-0 per cubic yard dry soil.

g. 1-pound of Potassium Sulfate 0-0-50 per cubic yard dry soil.

2. Mixing:

a. Blend materials uniformly with 50 percent dry existing soil excavated from plant pits and 50 percent dry imported topsoil in bulk by turning over materials with an end loader.
b. Blend materials in a clean area which will not contaminate mix.

c. Do not mix in planting areas.

B. Final Plant Pit Backfill Mix for Installation: Backfill mixes determined by the Landscape Architect and Horticultural Consultant upon review of the soil test report.

C. Preliminary In-Place Amendment of Planting Area Surfaces to Establish Bid (actual quantities contingent on amendment program determined by the Landscape Architect and Horticultural Consultant based on soil test report):

D. Final In-Place Amendment of Planting Area Surfaces: Determined by the Landscape Architect and Horticultural Consultant upon review of the soil test report.

2.4 SOURCE QUALITY CONTROL

A. Organic Amendment: Employ independent soil testing laboratory to test organic amendment for specified properties and submit test results.

PART 3 EXECUTION

3.1 EXAMINATION

A. General: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.

B. Subgrade: Verify that the subgrade is at the correct elevation and slope.

C. Underground Utilities and Structures: Verify that the locations of utilities, structures and other underground items have been clearly marked.

D. Notification of Unsuitable Conditions: Before proceeding with Work, notify the Owner’s Designated Representative in writing of unsuitable conditions and conflicts.

E. Soil Tests to Determine Final Plant Pit Backfill Mix, Planting Area Soil Surface Amendment Programs, and Maintenance Period Fertilization Programs:

1. Take fifteen 1-pound composite representative soil samples from locations determined by the Architect/Engineer in the field.

2. Send samples to Wallace Laboratories, 365 Coral Circle, El Segundo, CA 90245, and employ the laboratory to test the soil samples for the following or approved equal:
   a. pH measurement in the saturation extract per USDA Handbook No. 60, Method 21.
   b. Electrical conductivity of the saturation extract per USDA Handbook No. 60, Method 2.
   c. Sodium absorption ratio of the saturation extract per USDA Handbook No. 60, Method 20b.
   d. Determination of boron, calcium, copper, iron, magnesium, manganese, molybdenum, phosphorous, potassium, sodium, sulfur, and zinc, via the following test methods: Mehlich Number 3, Bray P1, Bray P2, Olsen P, DTPA, ammonium acetate, ammonium bicarbonate DTPA, and hot water extract from boron.
   e. Analysis of saturation extract for calcium, magnesium, sodium, boron, chloride, phosphorous, nitrate, and sulfate.
   f. Measurement of following trace metals by the DTPA extract: aluminum, arsenic, cadmium, chromium, cobalt, lead, lithium, nickel, selenium, silver, strontium, tin, and vanadium.
   g. Presence of calcium carbonate and magnesium carbonate.
   h. Estimate of soil texture per commonly used methods.
   i. Estimate of organic matter content per commonly used methods.
   j. Exchangeable Ammonium Cation.
   k. Base Saturation.
   l. Cation Exchange Capacity.
   m. Carbonates Determination.
   n. Soil Bulk Density.
   o. Water Infiltration Rate per USDA Handbook No. 60, Method 34b.
3. At least 30 days prior to commencement of soil preparation Work, submit to the Architect/Engineer and Horticultural Consultant the laboratory's written soil test report including the laboratory's soil test data; the laboratory's interpretation of nutritional deficiencies, excesses, and potential toxicities; the laboratory's amendment recommendations; and the laboratory's maintenance recommendations.
4. The Architect/Engineer and Horticultural Consultant will determine the final amendment and maintenance period fertilization programs based on the soil

test report which may differ from the soil test report amendment recommendations.

F. Soil Tests for Parasitic Nematodes:

1. Test soils which have been used for agricultural purposes within the prior 12 months for parasitic nematodes.

2. Soil will be acceptable if the parasitic nematode population is less than 200 per 50 cubic centimeters of soil.

3. Do not artificially dry soil prior to testing.

4. Submit written test report to the Architect/Engineer and Horticultural Consultant.

G. Soil Tests for Herbicide Contamination:

1. Perform a radish/rye grass growth trial on soils suspected of herbicide contamination.

2. Submit written test report to the Architect/Engineer and Horticultural Consultant.

3.2 WEED ERADICATION PROGRAM OF EXISTING VEGETATION AT PLANTING AREAS

A. Six weeks prior to planting and before tilling or amending planting areas, spray existing vegetation with 3 percent Glyphosate solution and repeat treatment 3 weeks later to kill re-emerging vegetation.

3.3 PREPARATION OF IN-PLACE PLANTING AREAS

A. Protection:

1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
2. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
3. Provide barricades, fences or other barriers to protect existing conditions to remain from damage and excessive compaction during construction.
4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
5. Submit written notification of conditions damaged during construction to the Owner’s Designated Representative immediately.

B. Tilling: Broadcast amendments, uniformly till soil surface to a 6 to 8-inch depth using a rototiller or other accepted tilling implement.

C. Cleaning Soil Surface: After tilling soil surface, clear soil surface of surface stones

larger than 1 inch, debris, roots, branches, sticks, contaminated soil, and other extraneous materials.

3.4 PREPARATION OF SUBGRADE TO RECEIVE IMPORTED SOIL MIXES

A. Protection:

1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
2. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
3. Provide barricades, fences or other barriers to protect existing conditions to remain from damage and excessive compaction during construction.
4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.

B. Submit written notification of conditions damaged during construction to the Owner's Designated Representative immediately. Ripping Subgrade Soil:

1. Prior to placing topsoil, rip areas to receive topsoil on the same day topsoil is placed.

2. Rip subgrade twice to a depth of **6** inches unless indicated otherwise.

3. Space ripping tines at 24 inches on center.

4. Make second ripping pass in a direction 90 degrees to the direction of the first ripping pass.

5. Do not rip closer than 2 feet horizontally and vertically to installed and existing utility lines and structures.

C. Topsoil Placement:

1. Place topsoil same day that subgrade soil ripping occurs and prior to vehicle or equipment traffic running over the ripped surface.
2. Place topsoil with equipment of appropriate size for area and in a manner that avoids excessive compaction of the topsoil.
3. Avoid repeatedly driving equipment in same tracks so that topsoil does not become excessively compacted.

D. Allowances: Place topsoil to elevations that allow for settlement, addition of soil amendment, and finish grading tolerances.

E. Topsoil Finished Grade: See Section 32 91 19.

F. Surface Drainage: Keep topsoil surface sloped so that surface drains.

G. Compaction and Contamination:

1. In handling materials and operating tools and equipment, protect the topsoil from excessive compaction by laying down planks, plywood, or other accepted protective devices.
2. Do not store or stockpile materials on the topsoil.
3. Do not allow vehicles to park or drive on topsoil, except equipment which is preparing and finish grading the soil.
4. If ruts are formed, blade rutted topsoil smooth.
5. Loosen excessively compacted soil to the full depth of the excessive compaction, rototill, and grade surface smooth.

H. Excessively Compacted Topsoil:

1. Mechanically loosen excessively compacted topsoil to its full depth via a method acceptable to the Landscape Architect and re-grade surface smooth.
2. Keep topsoil from being excessively compacted until date of Final Completion.

I. Erosion Repair:

1. Repair erosion that occurs between topsoil installation and plant or seed installation.
2. Fill eroded areas with topsoil and finish grade.

3.5 PREPARATION OF SOIL SURFACE OF PLANTING AREAS

A. Protection of Existing Conditions:

1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant materials and walks on or adjacent to the site of the Work.
2. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
3. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
5. Submit written notification of damaged plants and structures to the Owner’s Designated Representative immediately.

B. Surface Preparation:

1. Inspect soil surface for sticks, oils, chemicals, plaster, concrete, and other deleterious materials.
2. Do Work required to remove and dispose of the deleterious materials.

C. Excessively Compacted Areas:

1. Where tilled planting soil or imported planting soils have become compacted more than 75-percent maximum dry density per ASTM D 1557 rip soil to 4 inches below the depth of the excessive compaction.

3.6 Space ripping tines at 18 inches on center.AMENDMENT OF SOIL SURFACE OF PLANTING AREAS

A. Preliminary Amendment Program to Establish Bid for Planting Areas to, Except Areas within Drip Lines of Existing Trees to Remain: 6 cubic yards of organic amendment per 1,000 square feet; 25 pounds polymeric soil conditioner per 1,000 square feet; 20 pounds of granular Micromax per 1,000 square feet; 5 pounds of Triple Superphosphate 0-45-0 per 1,000 square feet, and 18 pounds of Nitroform 38-0-0 per 1,000 square feet.

B. Preliminary Amendment Program to Establish Bid for Areas Within Drip Lines of Existing Trees to Remain in Planting Areas: 3 cubic yards of organic amendment per 1,000 square feet, 10 pounds of polymeric soil conditioner per 1,000 square feet, 10 pounds of granular Micromax per 1,000 square feet, 9 pounds of Nitroform 38-0-0 per thousand square feet, and 2.5 pounds of Triple Superphosphate 0-45-0 per thousand square feet.

C. Final Amendment Programs for Installation: Determined by Architect/Engineer and Horticultural Consultant based on soil test report results.

D. Amendment Incorporation:

1. Spread dry amendments evenly over surface of dry soil with a drop spreader.

2. Organic amendment and soil must be dry.

3. Incorporate amendments uniformly within top 6 to 8 inches of soil within a few hours after amendment application, except at areas within drip lines of existing trees to remain.
4. At areas within drip lines of existing trees to remain, incorporate amendments uniformly to 1 to 2-inch depth within a few hours after application.
5. Mechanically incorporate the amendments into the soil via a method that will not excessively compact the soil below incorporated amendments.
6. To activate polymeric conditioner, irrigate soil very slowly so that soil surface will not form a crust and until water penetrates 6-inch depth.
7. Allow soil to dry until stringiness disappears.

8. Prior to planting, re-till soil to a 6-inch depth at areas outside of drip lines of existing trees to remain and re-till soil to a 1 to 2-inch depth at areas within drip lines of existing trees to remain.

3.7 FIELD QUALITY CONTROL

A. Soil Amendment Verification:

1. Schedule Horticultural Consultant to take up to 20 random composite samples

of amended soil surface areas and soil mixes for laboratory testing to verify amendment composition.

2. Submit composite samples collected by the Horticultural Consultant to the same soil testing laboratory used to test the soil as indicated in Article 3.1 E of this Section.
3. Employ the laboratory to test soil samples and submit test results to Horticultural Consultant and Architect/Engineer.
4. Perform corrective work as recommended by the laboratory soil test reports if directed to do so by the Architect/Engineer.
5. When a laboratory soil test indicates that the soil or soil mixes meet the requirements of the Specifications the Contractor will receive written notification of acceptance from the Architect/Engineer.
6. Installation of ground cover plants and seed may commence upon Contractor's receipt of the written notification of acceptance.

END OF SECTION

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SECTION 329119
LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes prevention of excessive weed growth in lawns.

B. Related Sections:
   1. Section 32 84 00 – Planting Irrigation.
   2. Section 32 91 13 – Soil Preparation.
   3. Section 32 92 00 – Lawns and Grasses.

1.2 DEFINITIONS

A. Finished Grading: Placing and grading of additional soil that may be required to bring the grade to the required grades for lawns, shrubbery, and groundcover beds.

B. Additional Fill Materials: Topsoil as specified herein unless otherwise specified.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-preparation operations.

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
   3. Minimize use of heavy machinery where practicable.

1.4 QUALITY ASSURANCE

A. Qualifications: Work shall be performed by personnel trained and experienced in the work and shall be done under the direct supervision of a superintendent on Contractor’s staff.

B. Workmanship: Perform work in conformance with recognized acceptable practices. Where job requirements require deviation from those practices, obtain approval from Landscape Architect before processing.

1.5 EXISTING CONDITIONS

A. Protection of Existing Utilities:

1. Existence and location of underground items are not guaranteed. Investigate and field verify before starting work. Excavation and backfill in the vicinity of existing items of work shall be carried out with extreme caution.
2. Contractor shall be held responsible for any damage and for maintenance and protection of existing utilities.
3. Indicate on record drawings where there is conflict between field conditions and drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Topsoil shall be free from herbicides and insecticides which might adversely affect subsequent growth of turf or plantings, or which might otherwise contain materials toxic to humans and pets.

B. Sand: Required product shall be “Bank Sand”. Submit sample for approval. Sand is not permitted for fine grading purposes if depth exceed 3/4 inches to achieve finished grade.

2.2 EQUIPMENT

A. Machinery: Machinery shall be approved by Owner. Contractor shall provide equipment and machinery sufficient for proper execution of Work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Landscape Architect's written permission.

3.4 FINISH GRADING

A. In areas to receive lawns, till, disc, or otherwise scarify soil removing all clods, stones, and related material one inch or larger. Place and spread any additional material that may be required.

B. Contractor shall be responsible for minor adjustments to finished subgrade if deemed required by Landscape Architect.

C. Hand rake surface, removing all clods and undesirable material greater than one-half inch from ground surface. Fill all low spots and cut irregularities to the acceptance of the Landscape Architect.

D. Finish all swales and additional swales that may be required to drain areas where there are existing plant materials during finished grading operations.

E. Prepare to immediately begin grassing operations of the completed and accepted finish grade to prevent excessive weed growth in lawn areas.

3.5 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 329119

SECTION 329200
LAWNS & GRASSES

PART 1 - GENERAL

1.1 SUMMARY

1. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Turf Grass and/or Ornamental Groundcover (via sown seed, stolon, plug, or sod) planting installation, as shown on the Contract Drawings, and as specified herein this Section.
2. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
    a. Sodded Turf Grasses.
3. Related Sections. The following Sections contain requirements that relate to Work in this Section:
    a. Section 329113 – Soil Preparation.
    b. Section 329300 – Exterior Plants.
    c. Section 329400 – Landscape Planting Accessories.
    d. Section 329813 – Landscape Establishment Period.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

1. References:
    a. ASPA – American Sod Producers Association.
    b. AOSA – Association of Official Seed Analysts.
2. Definitions:
    a. Plant Material(s): Refers to living plant species, inclusive of turf grass (via sown seed, stolons, and/or sod), ornamental grasses or groundcovers (via sown seed or sown plugs) for the Project.
    b. Planting Area (PA): As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
    c. Hydro-Mulching: Refers to the practice of sowing seeds (via hydro-seeding method) or stolons (via hydro-stolonizing method) together within a slurry mixture of water, fertilizer, cellulose (wood) fiber mulch, binder additive / soil and mulch

tackifier, and other additives and materials, which is sprayed uniformly on a prepared soil surface through a pressurized distribution system.

3. Measurements:

   a. SQ/FT: Measurement, in square-foot.

1.3 SUBMITTALS

1. General: Submit each item in this Article in four (4) bound Submittal Booklets.

2. Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other identification methods) and legible information on the following landscape information indicated in this Article:

   a. Product Data: Manufacturer's current catalog cuts and specifications for materials included herein this Section.

   b. Certifications:

      1) Certificates of inspection as required by law for transportation of each shipment of plant material as required.

      2) Sod Certification: Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

   c. Delivery Tickets: As requested, signed and stamped original delivery tickets of each material delivered to Project Site.

3. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

4. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE & CONTROL

1. Installer Qualifications:

   a. Requirement: Valid Texas General Contractors License.

   b. Engage an experienced Installer who has completed Work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.

   c. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

2. Observation: Landscape Architect may observe installation Work herein this Section at Project Site for compliance with requirements for type, size, and quality. Landscape

Architect retains right to observe installation of products for defects and to reject unsatisfactory or defective material or installation at any time during progress of Work. Contractor shall remove rejected Work immediately from Project site.

1.5 PROJECT SITE CONDITIONS

1. General Requirements: Installation under this Section shall be performed only during the time of day and during seasons when satisfactory results can be expected, unless authorized by the Landscape Architect.

   a. Sod: Install immediately after finish grading and irrigation installation are accepted.

2. Climate Restrictions: Do not install Plant Materials under this Section during rainy or inclement weather.

3. Hydro-mulching Operations:

   a. Irrigated Areas: Commence Work within fourteen (14) calendar days after the completion and acceptance of Soil Preparation (per Section 329113 – Soil Preparation.) in planting areas.

   b. Un-irrigated Areas: Commence work only between October 1st through February 28th, or as directed by the Landscape Architect. Should Contractor commences installation outside of this time frame, Contractor is responsible to provide temporary irrigation, as required, to un-irrigated areas to insure proper germination and growth establishment of the hydro-mulching materials to satisfy an minimum of 95% coverage of the hydro-mulched areas to satisfy Final Acceptance requirements.

1.6 SUBSTITUTIONS

1. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

2. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

3. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

4. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.7 WARRANTY

1. Time Period: Warrant Plant Materials under this Section are established and in a healthy and flourishing condition of active growth 90 days from date of Substantial Completion.

2. Appearance During Warranty:

   a. Turf Grass areas shall be free of dead or dying patches, and shall show foliage of a normal density, size and color.

3. Delays: Delays caused by the Contractor in completing planting operations under this Section which extend the planting into more than one (1) planting season shall extend the Warranty Period correspondingly.

4. Coverage: Warrant growth and coverage of installations under this Section to the effect that a minimum of 95% of the area planted shall be covered and of acceptable appearance with the specified planting after one (1) growing season, with no bare spots.

   a. Exceptions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, or natural disaster during Warranty Period. Report such conditions in writing.

1.8 FINAL ACCEPTANCE AND LANDSCAPE ESTABLISHMENT PERIOD

1. Refer to Section 329813 – Landscape Maintenance Period.

PART 2 - PRODUCTS

2.1 TURF GRASS MATERIALS

1. General:

   a. Provide sodded installation of Turf Grass areas as designated on the Contract Drawings.

2. Turf Grass Sod Material:

   a. Provide certified Turf Grass Sod complying with ASPA's Specifications for thickness, size, strength, moisture content, and mowed height. Provide Sod of grass species and varieties selected, proportioned by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed.

   b. Sod shall consist of live, growing, mature nursery-grown field stock, and shall arrive with a lush appearance, uniform texture, and a deep green color typical of the selected turf grass species.

   c. Sod shall be machine-cut from the nursery field with a minimum of one-half inch (1/2") of soil that completely covers the roots of the Sod. Sod shall contain a healthy, virile root system of dense, strong, thickly matted roots throughout, with no dead or dry edges, and capable of vigorous growth and development when

planted. Sod shall be sufficiently dense to bear handling and placement without tearing.

d. Sod shall be free of thatch, diseases, and harmful insects, and reasonably free from noxious or broadleaf weeds or other grasses, and shall not contain any other matter deleterious to its growth or which might affect its subsistence or hardiness when transplanted.

1) Sod shall be considered “weed free” if no more than ten (10) weeds are found per 100 SF of Sod.
2) Entire lot of Sod shall be rejected if found to contain the following weeds: quackgrass, nutgrass, johnsongrass, poison ivy, nimbleweed, thistle, bindweed, bentgrass, perennial sorrel, or bromegrass.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Verification of Conditions:

a. Grades: Verify that grades are within one-inch (1”) plus or minus (+/-) of the required finished grades. Verify that applicable soil preparation and erosion control materials have installed under other Sections of the Contract Specifications. Report all variations in writing.

b. Irrigation System: Verify that the irrigation system is installed and 100% coverage of the subject area is complete, tested, and in full working order. Complete installation of the irrigation system is a prerequisite for commencing work under this Section.

c. Stones, Weeds, and Debris: Verify that planting areas under this Section are clear of stones larger than 1/2 in. diameter, and that weeds, debris and other extraneous materials have been removed prior to installation.

3.2 PREPARATION

1. Limit sub-grade preparation to areas that will be planted in the immediate future.

2. Excessive Soil Moisture: Do not commence Work under this Section when Soil Moisture Content is so great that excessive compaction to the soil will occur during installation. Owner and/or Landscape Architect shall be the sole judges as to a acceptable soil moisture content.

3. Inadequate Soil Moisture: Apply water, in quantity as necessary, to bring soil to a optimum moisture content for installation under this Section. Do not work soil when it is so dry that dust will form in air or where clods will not readily break apart.

4. Cultivation of Slopes: Planting areas of 2:1 slopes and greater shall be ripped or cultivated to a depth of three inches (3”) immediately prior to hydroseeding. Refer to Section 329113 – Soil Preparation.

5. Hydro-mulching of Non-irrigated Grass/Wildflowers Areas: Installation shall only occur during the period between October 15th and December 1st.

6. Erosion Control Fabric: Refer to Section 329400 – Landscape Planting Accessories.

7. Contractor's Option: Perform manual hand seeding, machine, or hydro-mulching of planting areas.

8. Overseeding: Verticut/Mow Bermuda Grass as low as possible, removing any top growth. Plug aerate, scarify, and de-thatch. Remove clippings.

3.3 TURF GRASS SOD INSTALLATION

1. Delivery: Sod slabs shall be delivered on pallets and installed at the Project Site within twenty-four (24) hours after harvesting. Sod not installed within this time period shall be inspected and approved or rejected by the Landscape Architect. Do not lay sod if dormant.

2. Protection: Protect root system of the sod from exposure from the weather, including dehydration, contamination, and heating during transportation to the site and delivery. In hot, dry, or windy weather conditions, stacked sod at the Project Site shall be lightly sprinkled with water to prevent sod slab edges from drying out.

3. Allowance Period for Soil Settlement: Turf Grass Sod installation shall be started only after soil preparation and finish grading has been completed and soil has been permitted to settle under full irrigation during deep-water leaching operations for a minimum of two (2) weeks.

4. After Allowance Period of Soil Settlement has expired, the areas to be sodded shall be loosened to a depth of two-inches (2”), raked, and floated to the final finished grade by a standard acceptable method. Finished areas shall be kept moist, even, and smooth, free from ridges and depressions, rocks, debris, and dirt clods, and reasonably well firmed.

5. Compaction and Final Grading: Contractor shall provide sod beds that will not “footprint. Lightly rake and roll soil with two-hundred (200) pound water-ballast roller (filled 1/3 – 1/2 full), and bring level firm to finish grade. Final rolling shall be at right angles to slopes to prevent erosion. Sub-soil finish grade shall be sufficiently below the final grade to allow for the thickness of the sod material. Where applicable, newly sodded areas shall blend and match with existing turf grass areas so as to produce a smooth, unified field of turf grass.

6. Application of Fertilizer: Apply the Pre-plant Starter Fertilizer evenly throughout the area to be sodded, at the prescribed application rate. Evenly distribute fertilizer by applying equal quantities in two (2) directions at right angles to each other.

7. Raking: After broadcasting starter fertilizer, lightly rake and smooth seed bed surface to 1/4 in. depth. Install sod immediately thereafter, provided the sod bed has remained in a friable condition.

8. Sodding Operations:

a. Lay sod to form a solid mass with tightly fitted butt joints, with “green-side up”.

b. Starter Strip: Lay first row of sod in a straight line, with subsequent rows parallel to and tightly against each other.

c. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads (in a running-bond-type pattern) to offset joints in adjacent courses.

d. Avoid damage to sub-grade or sod during installation.

e. Tamp and roll lightly to ensure full contact with sub-grade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

f. Lay sod parallel to the lay of the sodded area. Lay sod across angle of slopes exceeding 3:1, beginning at the bottom of slope area.

g. Anchor sod on slopes exceeding 6:1 with wood stakes spaced at two (2) pegs per square yard. Provide not less than two (2) anchors per sod strip to prevent slippage.

h. Cutting: Use a sharp knife to cut sod to fit straight segments or curves (and apertures in "turfblock" paving). Trim sod in straight lines when planting beds are linear or parallel to the hardscape elements. Trim sod slabs in a smooth, continuous curve when sod edges are placed against curvilinear hardscape elements.

i. Mulch Ring at Sod in Turf Grass Areas: Trim sod in clean diameter circles around the perimeter of trees planted in turf grass areas, as indicated on the Contract Drawings. The Mulch Ring circles shall have the tree trunk located in the middle of the circle. Provide Organic Wood Mulch in these areas, at the designated thickness specified herein this Section.

9. Initial Watering: Saturate sod with fine water spray within two (2) hours of planting. Do not lay entire amount of sod before beginning watering. Water in lightly, when a relatively large area of sod has been placed.

   a. During first week, water daily to supplement rainfall as necessary to maintain moist soil to a minimum depth of two-inches (2”) below the sod until sod has rooted. Repeat watering at regular intervals until sod has established itself.

   b. Once established, decrease the watering frequency and increase the amount of water per application.

10. Protection on Site: Erect temporary barricades, warning signs & flags, as required. Protect the sodded areas against vehicular and pedestrian traffic until sodded areas have established growth to the satisfaction of the Owner or Landscape Architect.

11. Sod Establishment:

a. Mow and maintain turf height recommended by the turf grass nursery. Do not cut more than 40% of the total grass blade length in one (1) single mowing.

b. Replace dead or dying sod with new sod.

c. Eradicate weeds between second and third mowing. Apply herbicides uniformly at the Manufacturer's recommended rate.

d. Apply a second application of the Pre-plant Starter Fertilizer uniformly to the surface at the Manufacturer's recommended application rate thirty (30) days after seeding.

e. Dispose of protective barricades and warning signs at the termination of the sod establishment period.

3.4 FIELD QUALITY CONTROL

1. Tests: Samples of materials may be taken and tested for conformity to the Contract Specifications at any time by the Landscape Architect.

2. Rejected Materials: Remove rejected materials immediately from the site at Contractor's expense. Pay cost of testing of materials not meeting the Contract Specifications.

3. Intent: A consistent, thriving, and even cover of installed seed, sod, stolons, plugs, or hydro-mulching materials is the intent of this Section.

4. Satisfactory Installation: Hydro-mulching installation shall meet the following criteria, as determined by the Landscape Architect:

   a. At the end of the Landscape Establishment Period, a healthy, uniform, close stand of hydroseeded/hydrostolonized plant material has been established, free of weeds and surface irregularities, with coverage exceeding 90% percent coverage with no bare spots exceeding 6" inches. Failure to comply with this requirement shall extend the Landscape Establishment Period accordingly until the requirement is met.

3.5 CLEANING

1. Hydro-mulching Overspray: Upon completion of hydro-mulching operations, clean off any slurry overspray from drainage devices, paving surfaces, plant materials, and site or architectural features. Contractor shall exercise caution in cleaning these areas so as not to wash away previously hydro-mulched areas (as applicable).

2. Erosion: Immediately restore eroded areas. Keep adjacent paved surfaces cleaned of dirt, mud or stains and organic debris.

END OF SECTION

SECTION 32 93 00
EXTERIOR PLANTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Exterior Landscape Planting installation, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this section consists of, but is not necessarily limited to, furnishing and installing the following:
1. Trees.
2. Shrubs.
3. Ground Covers.
4. Vines.
5. Ornamental Grasses.
6. Annuals.
7. Perennials.

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
1. Section 311000 – Site Clearing.
2. Section 329113 – Soil Preparation.
3. Section 329200 – Lawns and Grasses.
4. Section 329400 – Landscape Planting Accessories.
5. Section 329813 – Landscape Establishment Period.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:
1. ASTM – American Society for Testing Materials.
2. USDA – United States Department of Agriculture.
3. ANSI – American National Standards Institute.

B. Reference Standards:
1. *An Annotated Checklist of Woody Ornamental Plants of California, Oregon, and Washington,* (Number 4091), McClintock and Leiser, Division of Agricultural Sciences, University of California, 1979.
2. *American National Standard for Nursery Stock (ANSI Z60.1).* American National Standards Institute, and American Association of Nurserymen, Latest edition,
3. *American Joint Committee on Horticultural Nomenclature*, 1942 Edition of Standardized Plant Names.

4. *Hortus III*, 1976 Edition, Liberty Hyde Bailey Hortorium, Cornell University.
5. *The Hillier Gardener's Guide to Trees and Shrubs*, 4th Edition, 1978.
6. *Manual of Cultivated Conifers*, Den Ouden & Boon, 1978.
7. *Datascape Guide to Commercial Nomenclature*, American Nurserymen Publishing Co., Chicago, IL, 1994.
8. *American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300),* American National Standards Institute, Latest Edition.

C. Definitions:
1. *Plant Material(s)* – Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
2. *Planting Area (PA)* – As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
3. *Plant Height* – Measurement of main body height, not measurement to branch tip.
4. *Plant Spread* – Measurement of main body diameter, not measurement from branch tip to branch tip.
5. *Amended Planting Backfill Mixture* – Refer to Section 329113 – Soil Preparation.
6. *Balled and Burlapped Stock* – Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
7. *Balled and Potted Stock* – Healthy, vigorous exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
8. *Bare-Root Stock* – Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
9. *Clump* – Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
10. *Container-Grown Stock* – Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
11. *Fabric Bag-Grown Stock* – Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
12. *Finish Grade* – Elevation of finished surface of planting soil.
13. *Manufactured Topsoil* – Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

14. *Multi-Stem* – Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
15. *Sub-grade* – Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
16. *Subsoil* – All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

D. Measurements:
1. sq/ft: Measurement, in square-foot.
2. O.C.: Measurement used for On-Center spacing.

1.03 SUBMITTALS

A. General: Submit each item in this Article in four (4) bound Submittal Booklets.

B. Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other identification methods) and legible information on the following landscape information indicated in this Article:
1. Alphabetized List of Plant Material.
2. Description of Plant Material, for each species indicated in the Contract Drawings, submitted in the following format:

(Provide Color Photograph of Plant Material here) (Note: Photograph shall include a person, tape measurer, or other scaled reference).

Project Name:	
Botanical Name:	
Common Name:	
Form (Multi, Standard, etc.):	
Container Size (as applicable:)	
Overall Height (provide Apical Meristem Height for Palms):	
Spread:	
Caliper (as applicable):	
Quantity Required (per Contract Drawings):	
Quantity Available (at supplying Nursery):	
Supplying Nursery Name:	
Contact Name at Nursery:	
Nursery Address:	
Nursery Phone Number:	
Date of Nursery Photo:	
Comments/Remarks:	

3. The Alphabetized List of Plant Material and Description of Plant Material shall not be construed as to acceptance of the Plant Material. All Plant Material shall be subject to review and approval by the Landscape Architect upon delivery to the Project Site.

C. Qualification data for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

D. Planting installation schedule, indicating anticipated locations and dates for each type of planting.

E. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

F. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.04 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications:
   1. Requirement: Valid Texas C-27 (Landscaping Contractor) License.
   2. Engage an experienced Installer who has demonstrated completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping installations under this Section are in progress.

B. Plant Material: Provide quality, size, genus, species, and variety of Plant Material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
   1. Selection of Plant Material purchased under allowances will be made by the Owner, who has the option to tag Plant Material stock at their place of growth before they are prepared for transplanting.
   2. At least one (1) plant of each Plant Material species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor that identifies the size and specific type of Plant Material upon delivery.
   3. Incorrect Planting Materials:
      a. Replace, at no cost to Owner, Plant Material that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
      b. Provide replacements equal to the size and quality to match the planted materials at the time the untrue species is discovered.
   4. Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

C. Observation: Landscape Architect may observe Plant Materials at either their place of growth or at the site before or after planting, for compliance with requirements for genus, species, variety, size and quality. Landscape Architect also retains right to observe Plant Material further for size and condition of root balls, trunks, branches, and crowns; insects; pests; disease; weeds; injuries, and latent defects. Landscape Architect reserves the right to reject unsatisfactory and/or defective Plant Material at any time during progress of Work. Contractor shall remove rejected Plant Material immediately from Project site.

D. Regulatory Requirements:
   1. Contractor shall meet the requirements of applicable laws, codes, and regulations as required by the authorities having jurisdiction over the Work.
   2. Provide for inspections and permits by Federal, State, and Local authorities in furnishing, transporting, and installing materials.

E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

F. Plant Material Review and Selection (Tagging):
   1. At the discretion of the Landscape Architect, Plant Material will be subject to review, photographed, and selected/tagged by the Landscape Architect at the nursery, or other place of growth, prior to delivery to the Project Site. Contractor shall verify with the Landscape Architect if tagging operations are required.
   2. Selecting/Tagging of Plant Materials at the nursery or place of growth does not cancel the right of the Landscape Architect to reject Plant Materials at the Project Site, if damaged or unacceptable conditions are found that were not detected at the nursery, place of growth, or in the submitted photographs.

G. Plant Material Delivery: Plant Material shall be delivered with original Plant Material tagging materials set in place, as selected and marked by the Landscape Architect at the nursery or place of growth. Contractor shall notify Landscape Architect upon deliver of Plant Material for review of stock and tagging materials. Plant Materials delivered without original tagging materials, or with broken, damaged, or altered tagging materials, shall be subject to rejection by the Landscape Architect. Rejected Plant Material shall be removed immediately.

H. Pre-installation Conference: Conduct conference at Project Site to comply with requirements of Division 1 Section "Project Meetings".

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Do not prune Plant Material before delivery, except as approved by the Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie Plant Material in such a manner as to destroy natural shape.

1. Immediately after digging field-grown Plant Materials, pack root systems in wet straw, hay, burlap, or other suitable material to keep root system moist until final planting installation.
2. Deliver freshly dug field-grown Plant Materials with firm, natural balls of earth of sufficient depth to include fibrous and feeding roots, meeting or exceeding requirements of ANSI Z60.1 for root ball diameter.

B. Handling Plant Materials:
1. Handle balled and burlap Plant Material stock by the root ball.
2. Handle container-grown Plant Materials only by their containers.
3. DO NOT handle Plant Materials by their trunks or stems.
4. DO NOT drop any Plant Materials.
5. DO NOT bind or handle Plant Materials with wire or rope.
6. Pad trunk and branches of Plant Materials whenever using hoisting cables, chains, or straps.
7. Should the Contractor engage in handling any Plant Material(s) by any unacceptable method(s), the Landscape Architect shall reserve the right to reject any of the mishandled Plant Material(s). The Contractor shall replace rejected Plant Material(s) with approved Plant Material(s), at no additional cost to the Owner.

C. Delivery: Provide protective covering during delivery. Deliver Plant Material only after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set Plant Materials in shade, protect from weather and mechanical damage, and keep roots moist. Anchor plants to prevent damage from winds.
1. Heel-in bare-root Plant Material stock. Soak roots in water for two (2) hours prior to planting.
2. Set balled Plant Material stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. DO NOT remove container-grown Plant Material stock from containers before time of planting.
4. Water root systems of Plant Material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.06 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Acceptance: Do not install Plant Materials prior to acceptance of finish grades and installation of irrigation system.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease planting operations and notify Landscape Architect for further direction.

D. Construction Site Observations: Landscape Architect may observe installation Work herein this Section at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe installation of products and materials for defects and to reject unsatisfactory or defective product, material, or installation at any time during progress of Work. Contractor shall remove rejected Work immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.07 PROJECT SITE CONDITIONS

A. General: Installation of Plant Materials shall be performed only during the time of day and during seasons when satisfactory results can be expected, unless authorized by the Landscape Architect.

B. Climate Restrictions: Do not install Plant Materials during rainy or inclement weather.

1.08 SUBSTITUTIONS

A. Consideration: Plant Materials to be considered equal to the Plant Materials indicated herein this Section shall be reviewed by the Landscape Architect. Plant Materials with equal performance characteristics may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, or intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.
   1. Substituted Plant Materials shall be true to species and variety and shall conform to measurements specified, except that plants larger than specified may be used if accepted. If larger Plant Materials are accepted, increase the ball of earth in proportion to the size of the plant, as required. Plant Materials overgrown for their container size will be rejected.

B. Specific reference to Manufacturer’s names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Plant Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Plant Materials under this Section shall not increase the Contract price.

1.09 WARRANTY

A. General: The Warranty indicated herein in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract, and shall be in addition to, and run concurrent with, other guarantees or warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty: Contractor shall warrant living Plant Materials under this Section for a period of one (1) year after date of Substantial Completion. Warrant against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by the Owner; abnormal weather conditions unusual for the Warranty Period; or incidents which are beyond the Contractor's control.

C. Replacement of Plant Material:
   1. Replace Plant Materials exhibiting conditions which are determined to be unacceptable due to workmanship by the Contractor, at no cost to the Owner, per the direction of the Landscape Architect.
   2. Remove and replace dead or dying Plant Material immediately unless required to plant in the succeeding planting season.
   3. Contractor shall be held responsible for a maximum of two (2) replacement of each failed Plant Material after Final Acceptance during the Warranty Period.
      a. Closely match replacements to adjacent specimens of the same species. Apply requirements of this Specification to replacements.

1.10 FINAL ACCEPTANCE AND LANDSCAPE ESTABLISHMENT PERIOD

A. Refer to Section 329813 – Landscape Establishment Period.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PLANT MATERIAL

A. Immediately upon award of Contract for Work in this Section, the Contractor shall locate and purchase or hold for purchase plant material as required.
   1. Contractor shall verify with Landscape Architect of Plant Material that has been nursery “contract grown” by the Owner for use of Work under this Contract.
   2. Contractor shall review the condition of the Plant Material with Landscape Architect at the nursery maintaining the Plant Material prior to delivery, and when delivered to the Project Site.

B. Quality: Plant Materials shall have a growth habit typical for each variety and species indicated in the Plant List (as detailed on the Contract Drawings).
   1. All Plant Materials shall be superior grade nursery stock, symmetrical, with tightly knit branching, so trained or favored in development and appearance in form, number of branches, compactness and symmetry, healthy, and vigorous in growth, as reviewed and determined by the Landscape Architect.
   2. Plant Materials shall be free from insect pests, eggs and larvae, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, windburn, salt burn, weeds, or other disfigurements or conditions, as reviewed and determined by the Landscape Architect.

3. Plant Material shall be subject per the Texas State Department of Agriculture's Regulations for Nursery Inspections of Rules and Grading.
4. Growing Conditions: Plant Materials shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.

C. Container Stock (excluding annuals) shall be grown in boxes or containers in which delivered for at least one (1) growing season, but not over two (2) years. Plant Material grown in boxes or containers shall be cultivated during this time to permit full rooting within the specified box or container to bind the planting soil, but not so long as to create a "root-bound" condition.
1. Plant Material shall be completely free of circling, kinked or girdling trunk surface and center roots, and show no evidence of a pot-bound condition.
2. No boxed nor container Plant Material shall be planted which have cracked or broken balls of earth when separated from their boxes or containers.
3. No Plant Material shall be planted with damaged roots, broken root balls, or which are found to be "root-bound" when separated from their containers.

D. Pruning:
1. Do not prune Plant Materials unless directed by the Landscape Architect.
2. Pruning of Plant Material as grown at the nursery shall conform to ANSI A300 standards.
3. Consult with Landscape Architect for pruning Plant Materials after delivery and installation.

E. Measurements: Measure Plant Material according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes.
1. Take caliper measurement at a point on the trunk six-inches (6") above natural ground line for trees up to four-inches (4") in caliper (at a point twelve-inches (12") above the natural ground line for trees over four-inches (4") in caliper).
   a. Measure foliage across mean foliage dimension when branches are in their normal upright position.
   b. For trees to be supplied in "raised up" condition, foliage origin along main trunk shall be measured from soil line after installation.
   c. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension.
2. Size Range: If a range of size is given, do not use Plant Materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plant Materials that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.

F. Field Dug Stock: Prior to digging of field-grown Plant Materials, insure that excess loose fill resulting from cultivation around trunks/stems and over roots be removed down to natural finish grade at crown of Plant Materials. During digging, verify that size of tree spade or other equipment is adequate to encompass the actively growing root

zone of all Plant Materials. Plant Materials which, after digging, show mostly large fleshy roots and few fibrous roots, will be rejected.

G. Condition of Root Systems: Plant Materials must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition. Upon inspection by Landscape Architect at the job site, if five-percent (5%) or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species shall be rejected.

H. Unacceptable Trees: Trees that have damaged, broken, pruned, or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused will be rejected.

2.02 SHADE AND FLOWERING TREES

A. Shade and Flowering Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitations for container stock.
   1. Branching Height: 1/2 of tree height, unless otherwise indicated on Contract Drawings.

B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitations for container stock.
   1. Form: As indicated on the Contract Drawings for individual selected species. <<<VERIFY>>>

C. Field Dug Specimen Trees & Palms: <<<VERIFY>>>
   1. Form and Size: As specified on the Contract Documents for height, spread, and/or caliper, subject to review and acceptance by the Landscape Architect at the supplying nursery prior to delivery and installation. Provide superior quality, full, symmetrical, well-rooted, upright, spreading, with well-balanced crown.
   2. Subject to compliance with requirements, provide trees by one (1) of the following supplying Nurseries:
      a. <<<VERIFY>>>.

2.03 SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of Shrub, subject to review and acceptance by the Landscape Architect. Container-grown Shrubs will be acceptable in lieu of balled and burlapped.

1. Container-grown Shrubs shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.04 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, well-rooted, coniferous evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Boxed or container-grown coniferous evergreens will subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.05 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, well-rooted , broadleaf evergreens, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown broadleaf evergreens shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.06 GROUND COVERS

A. Provide ground covers full, established, and well-rooted in removable flats, containers, or integral peat pots, and with not less than the minimum number and length of runners required by ANSI Z60.1 for the container size indicated, and other requirements as indicated on the Contract Drawings, subject to review and acceptance by the Landscape Architect.

2.07 VINES

A. Form and Size: Normal-quality, established, full, well-balanced, well-rooted, nursery staked, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown vines shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.08 CACTI/SUCCULENTS

A. Form and Size: Superior-quality, established, full, symmetrical, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.09 ORNAMENTAL GRASSES

A. Form and Size: Normal-quality, established, full, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.10 ESPALIERS

A. Form and Size: Superior-quality, established, full, well-balanced and trained along wooden staked grid, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

PART 3 EXECUTION

3.01 EXAMINATION

A. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED ACCORDINGLY BY THE LANDSCAPE ARCHITECT.

B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.
   1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.
      a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
      b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
      c. Do not commence planting installation prior to acceptance of Section 329113 – Soil Preparation.

D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect's acceptance prior to commencing physical planting installation. Contractor shall make minor adjustments to the planting layout as required, per the direction of the Landscape Architect.

F. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.

G. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.

H. Finish Grades for planting areas shall have been established (per Section 312219 – Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1"+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 329113 – Soil Preparation).
   1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.

I. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide regular irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 328400 – Irrigation Systems).

3.02 EXCAVATION FOR PLANT MATERIAL

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 329113 – Soil Preparation, excavate planting hole(s) for Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Excavate holes according to the spacing alignment (i.e. hedge spacing, grid spacing, triangular spacing, etc.) and the on-center (O.C.) spacing intervals (i.e. 24" O.C. etc.) indicated on the Contract Drawings. Loosen any hard subsoil in the bottom of the excavation where evident, and remove all rocks greater than one-half-inch (1/2") in diameter, trash, debris, etc. Retain the excavated soil for use as part of the Amended Planting Backfill Mixture (as indicated in Section 329113 – Soil Preparation).
   1. Bare-Root Plant Material:

a. Excavate at least twenty-four-inches (24”) wider than the perimeter of the bare root spread, and deep enough to allow setting of the roots on a compacted layer of native planting soil, where the top of the plant’s root collar is one-inch (1”) higher than finished grade or as further directed by the Landscape Architect:
b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6”) depth of native planting soil.
c. Where Tree Root Aeration Units are indicated (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth allowing for installation of the Tree Root Aeration Unit assembly.

2. Balled and Burlap Plant Material:
   a. Excavate the planting hole to the width and depth indicated in the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant’s root collar is one-inch (1”) higher than finished grade or as further directed by the Landscape Architect:
   b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6”) depth of native planting soil.
   c. Where Tree Root Aeration Unit(s) are indicated (per Section 329400 – Landscape Planting Accessories provide further excavation in the planting hole by auger to the required minimum depth allowing for installation of the Tree Root Aeration Unit assembly.
3. Container-Grown Plant Material:
   a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant’s root collar is one-inch (1”) higher than finished grade or as further directed by the Landscape Architect:
   b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6”) depth of native planting soil.
   c. Where Tree Root Aeration Unit(s) are indicated, (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth for installation of the Tree Root Aeration Unit assembly.
4. Field Grown/Specimen Trees:
   a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant’s root collar is one-inch (1”) higher than finished grade or as further directed by the Landscape Architect:
   b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6”) depth of native planting soil.
   c. Where Tree Root Aeration Unit(s) are indicated (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth for installation of the Tree Root Aeration Unit assembly.
   d. In areas where special subsurface drainage for planting is indicated, tie drainage pipes, as required, into the drain system.

e. Excavate planting hole at 3x the diameter of the rootball.

B. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.
1. Hardpan Layer: If encountered, drill six-inch (6") diameter holes into free-draining strata or to a depth of ten-feet (10'), whichever is less, and backfill with free-draining material.

C. Drainage: Notify the Landscape Architect if subsoil conditions show evidence of unexpected water seepage or retention in planting holes.

3.03 PLANTING PLANT MATERIAL

A. Bare Root Plant Material: Set Bare Root Plant Material plumb and in center of the excavated hole, with top of root ball set properly at the adjacent finish grade as indicated. Set Bare Root Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
1. Thoroughly soak the roots of the Bare Root Plant Material in clean water for a minimum of twelve (12) hours but no more than twenty-four (24) hours to fully hydrate the root mass. Do not soak above the root crown.
2. Remove wood shavings or other material used to keep the exposed root mass in a moist condition.
3. Carefully place the Plant Material stock on the specified setting layer of compacted native soil, with the top of root mass set approximately one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide an orientation of the Plant Material that is confirmed and acceptable by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, carefully handle the Plant Material by its trunk.
4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 329113 – Soil Preparation).
b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 329113 – Soil Preparation).
c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 – Soil Preparation), per the Manufacturer's latest printed instructions.
1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic

Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.

5. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 329400 – Landscape Planting Accessories).
6. Backfilling the excavated planting hole:
   a. Place the Amended Planting Backfill Mixture around the Plant Material root mass in the excavated planting hole. Place the Mixture in six-inch (6”) lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
   b. Maintain the Plant Material plumb while working the Mixture around the root mass. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments, (per Section 329113 – Soil Preparation) as required, at the prescribed application rates (as indicated per Section 329113 – Soil Preparation) or if not indicated, per the Manufacturer’s latest printed instructions.
   d. Place the final layers of the Amended Planting Backfill Mixture, tamping accordingly, to the top of the root mass.
   e. Dish and tamp top of the Mixture to form a three-inch (3”) deep watering basin centered on the Plant Material’s trunk to the rim width of the planting hole.
   f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
7. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 329400) – Landscape Planting Accessories for type and requirements.

B. Balled and Burlapped Plant Material: Set the Balled and Burlapped Plant Material plumb and in center of the excavated hole, with top of the root ball raised above adjacent finish grade as indicated. Set Balled and Burlapped Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
   1. Carefully place the Balled and Burlapped Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1”) above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, handle the Plant Material by its root ball; avoid handling the Plant Material by its trunk.
   2. Once orientation is accepted, carefully remove the burlap and wire baskets from the tops of the root ball and partially from the sides, but do not remove from under the root ball. Do not damage the root ball or any part of the plant. Plant Material shall be rejected if the root ball is cracked or broken before or during the planting operation.

3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
   a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 329113 – Soil Preparation).
   b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 329113 – Soil Preparation).
   c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 – Soil Preparation), per the Manufacturer's latest printed instructions.
      1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
         a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
4. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 329400 – Landscape Planting Accessories.
5. Backfilling the excavated planting hole:
   a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
   b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments, (per Section 329113 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
   d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
   e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
   f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
6. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for type and requirements.

C. Container-Grown Plant Material: Set Container-Grown Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grade as indicated. Set Container-Grown Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
   1. For plastic container stock (4” pot, 1-gallon, 5-gallon, 15-gallon, etc.), carefully remove the plant container prior to setting the plant in the excavated hole so as not to damage root ball. Tip container to horizontal position and shake carefully to remove Plant Material. Support root ball during installation to prevent cracking or shedding of soil.
   2. Set the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1”) above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the plant material, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk.
      a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
   3. For wooden boxed container stock, carefully set whole boxed container of the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1”) above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk or branches. Once orientation is accepted, remove the steel strapping and the sides of the wooden container so as not to damage the root ball or any part of the plant. Do not remove the bottom of the wooden container. Discard sides.
      a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
   4. Scarification: After removing container from plant, scarify the sides of the root ball to a depth of one-inch (1”) at four (4) to six (6) equally-spaced locations around the perimeter of the root ball or at twelve-inch (12”) intervals on sides of wooden boxed container stock. Cut and remove circling roots over 3/8 in. diameter.
   5. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
      a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 329113 – Soil Preparation).
      b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 9113 – Soil Preparation).

c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 – Soil Preparation), per the Manufacturer's latest printed instructions.
   1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
      a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.

6. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 329400 – Landscape Planting Accessories).
7. In areas where indicated on the Contract Drawings, install the Deep Watering Bubblers as part of the irrigation system.
8. Backfilling the excavated planting hole:
   a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets. Foot tamp the backfill, as required.
   b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments (per Section 329113 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
   d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
   e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
   f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
9. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for type and requirements.

D. Field-Dug Specimen Plant Material: Set Field-Dug Specimen Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grades as indicated. Set Field-Dug Specimen Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. After excavation of the planting hole, provide subsurface piping drainage and/or Tree Root Aeration Units as indicated on the Contract Drawings. Tie subsurface drainage into storm drainage system, where required. Install the Tree Root Aeration Units, where required.
2. Carefully set the Field-Dug Specimen Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, carefully handle the Plant Material by a cradle around its root ball mass or by its planting container; avoid handling the Plant Material by its trunk.
    a. For Field-Dug Specimen Plant Material delivered in a wooden boxed container, do not remove sides or bottom of the container until the Specimen's orientation is accepted by the Landscape Architect. Once orientation is accepted, remove steel strapping and the sides of the wooden container so as not to damage the root ball or any part of the Specimen. Do not remove the bottom of the wooden container. Discard sides.
        1) Any Specimen with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
3. Scarification: After removing container from plant, scarify the sides of the root ball to a depth of one-inch (1") at four (4) to six (6) equally-spaced locations around the perimeter of the root ball or at twelve-inch (12") intervals on sides of wooden boxed container stock. Cut and remove circling roots over 3/8 in. diameter.
4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing and blending in the following:
    a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 329113 – Soil Preparation).
    b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 329113 – Soil Preparation).
    c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 329113 – Soil Preparation), per the Manufacturer's latest printed instructions.
        1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
            a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
5. In areas indicated on the Contract Drawings, install the Deep Watering Bubblers as part of the irrigation system (per Section 328400 – Irrigation Systems).

6. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 329400 – Landscape Planting Accessories).
7. Backfilling the excavated planting hole.
    a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
    b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
    c. Add the Fertilizer Tablets and other amendments, as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
    d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
    e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole.. Do not cover the top of the root ball with the backfill mixture.
    f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
8. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for type and requirements.

E. Plant Settling and Orientation: Plant Material that has settled deeper than the surrounding grade shall be excavated and raised to the correct level, to the satisfaction of the Landscape Architect. Plant Material installed without direction and/or approval as to its proper orientation shall be subject to excavation and acceptable orientation, to the satisfaction of the Landscape Architect.

F. Fertilizer Tablet(s) Application Rate: Refer to Section 329113 – Soil Preparation.

3.04 PLANTING GROUND COVERS, VINES, AND ESPALIERS

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 329113 – Soil Preparation, excavate planting hole(s) for Ground Covers and/or Vine Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Refer to requirements indicated in Part III of this Section for Excavation.
    1. Plant Settling: Plant Material that has settled deeper than the surrounding grade shall be raised to the correct level.

B. Excavate holes according to the spacing alignment (i.e. triangular spacing, etc.) and the on-center (O.C.) spacing intervals (i.e. 24" O.C. etc.) indicated on the Contract Drawings. Loosen any hard subsoil in the bottom of the excavation where evident, and remove all rocks greater than one-half-inch (1/2") in diameter, trash, debris, etc.

C. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.

D. Ground Covers: Follow applicable planting requirements per Articles 3.02 and 3.03 indicated herein this Section.
   1. Carefully set root mass into excavated hole, spreading roots, and backfill with planting soil.
   2. Add Fertilizer Tablets and other amendments, as required, within backfill.
   3. Work soil around roots to eliminate air pockets, and provide a slight saucer indentation around plants to retain surface water.
   4. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Vines: Follow applicable planting requirements per Articles 3.02 and 3.03 indicated herein this Section.
   1. Carefully set root mass into excavated hole, spreading roots, and backfill with planting soil.
   2. Add Fertilizer Tablets and other amendments, as required, within backfill.
   3. Work soil around roots to eliminate air pockets, and provide a slight saucer indentation around plants to retain surface water.
   4. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
   5. After planting, remove nursery training stakes, tags, and ties. Carefully secure Vines to adjacent surface as indicated on Contract Drawings or as directed by the Landscape Architect.
   6. "Fan out" the Vine canes/branches in a symmetrical/radiating pattern from the root crown of the vine. Secure canes/branches to the adjacent surface (wall, fence, etc.) with specified ties, minimum of three (3) ties per vine, or in an adequate quantity to satisfactorily train/support the vine.
   7. Backfill and tamp the nursery stake void(s) with planting soil.

F. Espaliers: Follow applicable planting requirements per Articles 3.02 and 3.03 indicated herein this Section.
   1. Orient Espaliers with most attractive side of Espalier set facing outwards (i.e. when placed against a building or fence, orient with most attractive side away from building or fence, as acceptable to the Landscape Architect.
   2. Espaliers shall be set with the wooden framing structure lying parallel to the face of the building, wall, fence, etc., and close enough to allow growth of the espalier to adequately fill to the face of the building, wall, fence, etc. Do not remove wooden framing structure unless otherwise directed by the Landscape Architect.
   3. Carefully set root mass into excavated hole, spreading roots, and backfill with planting soil.
   4. Add Fertilizer Tablets and other amendments, as required, within backfill.

5. Work soil around roots to eliminate air pockets, and provide a slight saucer indentation around plants to retain surface water.
6. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.05 INSTALLATION OF PLANTING CONTAINERS <<<VERIFY>>>

A. Locate Planting Container(s) accordingly in the designated location(s) per the Contract Drawings.

B. Level and plumb Container(s) accordingly for drainage and irrigation, as required.

C. Cover bottom holes of Planting Container (if any) with Geotextile Filter Fabric, as required. Place at least a four-inch (4”) layer of Drainage Rock in the bottom of the Planting Container. Cover top of Rock with Geotextile Filter Fabric, and continue up sides of Planting Container to within six-inches (6”) of top of Container.

D. Install Tree Root Aeration Unit Assembly, as required.

E. Partially-fill the Planting Container with specified Planting Container Soil Mixture (per Section 329113 – Soil Preparation) in six-inch (6”) lifts, as needed, and tamp accordingly to provide a relatively-firm setting layer of compacted Mixture, allowing for the top of Plant Material root ball to be set approximately one-inch (1”) above the finished grade in the Planting Container, allowing for settlement of the Plant Material. Provide orientation and layout of Plant Material in the Container that is confirmed and accepted by the Landscape Architect.

F. Continue to place the Planting Container Soil Mixture in six-inch (6”) lifts, carefully working around the root ball(s), and tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
   1. Add the Fertilizer Tablets and other amendments, as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer’s instructions, once the Container is half-filled with the Mixture.

G. Continue backfilling operations in lightly compacted layers to an elevation of one-inch (1”) inch below the top of planter, allowing natural settlement. Do not place the Mixture on top of the root ball.
   1. Maintain the plant plumb while working the Mixture around the root ball.

H. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the Planting Container Soil Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

I. Mulching: Apply Mulch in Container as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for type and requirements.

3.06 PRUNING PLANT MATERIAL

A. At no time shall Plant Material be pruned, trimmed, thinned, shaped, or topped prior to delivery. Pruning, trimming, thinning, shaping, or topping of Plant Material shall be only conducted on the Project Site, and under the presence and direction of the Landscape Architect or approved Certified Arborist. Plant Material that has been pruned and delivered to the Project Site without prior approval by the Landscape Architect or an approved Certified Arborist will be rejected.

B. When directed by the Landscape Architect or an approved Certified Arborist, Contractor shall prune, thin, and shape plant material, according to standard horticultural practice, to preserve the natural character of the Plant Material.
   1. Pruning and remedial work shall be done per ANSI A300.
   2. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from trees.
   3. Prune shrubs accordingly to retain natural character.
   4. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
   5. Newly planted trees shall be pruned near the termination of the Landscape Establishment Period, per the direction of the Landscape Architect, as required.

3.07 CLEAN UP AND PROTECTION

A. During installation operations, keep Work area in an orderly and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, surplus soil and other items resulting from construction operations and legally dispose of it off the Owner’s property.

D. Scars, ruts, or other marks in the ground caused by the Contractor’s Work shall be repaired.

E. Remove equipment and implements of service, and leave the entire Project Site area in a neat, clean, and Owner-approved condition.

F. Labels: Remove all nursery-type labels, flags, and or identification markings from Plant Materials.

3.08 FINAL REVIEW

A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. Refer to Section 329813 – Landscape Establishment Period, for requirements.

END OF SECTION

SECTION 329313
TREES, SHRUBS, AND GROUNDCOVER

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
   a. Trees.
   b. Shrubs.
   c. Ground cover.

1.2 REFERENCES

1. "Grades and Standards", latest edition, Texas Association of Nurserymen Specifications, Austin, Texas 78704.

2. "American Standard for Nursery Stock", American National Standards Institute, Incorporated, (ANSI Z 60).

3. "Standardized Plant Names", 1942 Edition, American Joint Committee on Horticultural Nomenclature

1.3 DEFINITIONS

1. Backfill: The earth used to replace or the act of replacing earth in an excavation.

2. Finish Grade: Elevation of finished surface of planting soil.

3. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

4. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

5. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

6. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

1. Product Data: For each type of product indicated provide requested copies of manufacturers literature, samples, certifications, and laboratory analytical data:
   a. Trees, shrubs, and groundcovers – Samples and/or photographs.
   b. Mulch – manufacturer's literature and sample.
   c. Tree and shrub planting fertilizer – certification or laboratory analytical data.
   d. Tree paint – manufacturer's literature.

2. Product certificates.

3. Planting Schedule: Indicating anticipated planting dates for exterior plants.

4. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year.

1.5 QUALITY ASSURANCE

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

2. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

   a. Report suitability of topsoil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

3. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

4. Source - Quality Control:
   a. Plants shall be subject to inspection and approval by Landscape Architect at place of growth and upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the Work. Submit written request for inspection of plant material at place of growth to Landscape Architect. Written request shall state the place of growth and quantity of plants to be inspected. Landscape Architect reserves right to refuse inspection at this time if a sufficient quantity of plants is not available for inspection. All plant material shall be tagged by the Landscape Architect at the nursery.
   b. All plants inspected at the nursery by the Landscape Architect shall be tagged with serialized self-locking tags. Trees delivered to the site without these tags or with broken tags shall be sufficient reason for rejection.
   c. Substitutions of plant materials will not be permitted unless authorized in writing by Landscape Architect. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract Price. Such proof shall be substantiated and submitted in writing to Landscape Architect at least thirty (30) days prior to start of Work under this Section. These provisions shall not relieve

Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.

5. Inspections: Make written request for inspection after planting operations have been completed. Such inspection is for the purpose of establishing the Maintenance Period.

6. Submit written requests for inspections to the Landscape Architect at least seven (7) days prior to anticipated inspection date.

7. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

1. Submit plan for transporting plant material to site to Landscape Architect for approval. Plan should include:
   a. Date of pick-up at nursery or place of storage.
   b. Type of vehicle used for shipping.
   c. Method of protecting trees during transit.
   d. Dates in transit.
   e. Date of delivery to site.
   f. Projected date of installation.
   g. Means of storage, watering and shading used between delivery and planting.

2. Landscape Architect suggests the following considerations for the Contractor to evaluate in product handling:
   a. During hot weather and when practical, the Contractor may be required to transport plant materials between sunset and sunrise if transported in an open trailer or unrefrigerated box.
   b. Dug material should be maintained and watered as required at the nursery to guarantee their vitality and health until shipping.
   c. Protect all trunks, stems, branches and root balls during tree tying, wrapping and loading operations from damage.
   d. Load balls or containers onto transport vehicle and secure in a manner that protects the structural integrity of the root balls.
   e. The Contractor shall be solely responsible for the safe transportation of plants to the site and their condition upon arrival. Trees damaged, dehydrated or abused during transit and storage will be rejected.
   f. Plant materials should not be stored on concrete or left exposed to the sun.
   g. Protect the balls and water regularly until planting. If trees are left in storage over the weekend or holiday, provide a means of periodical watering and inspecting root ball protection.

3. Landscape Architect may inspect any phase of this operation and may reject any plant material improperly handled during any phase of this operation.

4. D. Nothing in this Section shall be interpreted as relieving the Contractor of the responsibility of providing healthy, viable plants, nor shall it have any affect upon the terms of the warranty specified herein.

5. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.

6. Handle planting stock by root ball.

7. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.7 FINAL ACCEPTANCE

1. Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work including maintenance, but exclusive of replacement of plant materials under the warranty period. Upon Final Acceptance, Owner will assume responsibility for maintenance of Work.

1.8 WARRANTY

1. Special Warranty: Installer's standard form in which Installer agrees to repair or replace plantings that fail in materials, workmanship, or growth within specified warranty period.

    a. Failures include, but are not limited to, the following:
        1) Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner, or incidents that are beyond Contractor's control.
        2) Structural failures including plantings falling or blowing over.

    b. Warranty Periods from Date of Substantial Completion:

        1) Trees and Shrubs: One year.
        2) Ground Cover and Plants: Three months.

1.9 MAINTENANCE SERVICE

1. Initial Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below.

a. Maintenance Period for Trees and Shrubs: 12 months from date of Substantial Completion.
b. Maintenance Period for Ground Covers and Plants: Three months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREES, SHRUBS, VINES, AND GROUNDCOVER

1. Plants shall be nursery grown in accordance with good horticultural practices under climatic conditions similar to those of project for at least two years unless specifically otherwise authorized by Landscape Architect in writing. Unless specifically noted otherwise, all plants shall be exceptionally heavy, symmetrical, tightly knit, so trained or favored in development and appearance as to be superior in form, number of branches, compactness and symmetry.

2. Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae, and shall have healthy, well developed root systems. They shall be free from physical damage or adverse conditions that would prevent thriving growth.

3. Plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if approved by Landscape Architect. Use of such plants shall not increase Contract price. If larger plants are approved, the ball of earth or container size shall be increased as specified under "Applicable Standards" and subject to the approval of the Landscape Architect.

4. Plants shall be measured when branches are in their normal position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip.

5. Container stock, when specified, shall have grown in the containers in which delivered for at least six (6) months. but not over two (2) years. Samples must prove no root-bound conditions exist. No container plants that have cracked or broken balls of earth, when taken from container, shall be planted except upon special approval by Landscape Architect. Container stock shall not be pruned before delivery. Field grown plants recently transplanted into containers will not be accepted.

6. Nursery grown B&B material shall be pruned and thinned at the place of growth immediately prior to digging as required for packaging and safe moving. Method of pruning shall be as approved in the field by the Landscape Architect. Do not remove self-locking tags during this pruning prior to delivery to site.

2.2 COMMERCIAL FERTILIZERS

1. Shrub/Groundcover Fertilizers: Agri-Form 20-10-5, 21 gram tablets.

2. Tree planting fertilizer: Davey Arborgreen Organic Liquid Soil injected at 115 PSI. Apply at mfg. recommended rates.

3. Top-dress Fertilizer: Complete fertilizer, 50 percent of the nitrogen to be derived from organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from potassium sulfate containing 60 percent potash.

2.3 PRE-EMERGENCE WEED CONTROL

1. In areas of Woody Ornamental Plants, Eptam or Eptam -5-G as manufactured by Greenlight Products Company, or approved equal.

2.4 STAKING MATERIALS

1. Use staking materials necessary to meet requirements of specifications, subject to approval. Suggested materials:
   a. Tree Stakes: Eight (8') feet long steel T-Post weighing 1.33 pounds per foot.
   b. Ties: Black rubber 3/4-inch hose with 3/16-inch wall thickness
   c. Tree Guying Material: #10 gage galvanized multi-strand cable.
   d. Cable Clamps: Size needed to hold two strands together.

2.5 MULCH

1. Shredded Hardwood bark.

2.6 INSECTICIDE

1. Ortho "Lindane Borer and Leaf Miner Spray" by Ortho, Consumer Products Division, Chevron Chemical Company, San Francisco, California 94119, or "Borer Killer" by Greenlight Company, San Antonio, Texas 78217.

2.7 WATERING TUBES

1. Gray, perforated SDR PVC drainage pipe, 4 inches in diameter.

PART 3 - EXECUTION

3.1 LAYOUT AND EXCAVATION OF PLANTING AREAS:

1. Layout plants in locations shown on Drawings. Use wire stakes color-coded for each specie of plant material. Stake location of each tree and major shrub and outline of shrub and groundcover beds.

2. Landscape Architect will check location of plants in the field and shall adjust to exact position before planting begins.

3. Subsoil shall not be worked when moisture content is so great that excessive compaction will occur, nor when it is so dry that clods will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

4. Excavate container grown shrub and groundcover beds to the following dimensions: (spacing 36" o.c. or less)

3.2 DRAINAGE, DETRIMENTAL SOILS, AND OBSTRUCTIONS:

1. Test drainage of plant beds and pits by filling with water twice in succession. Conditions permitting the retention of water in planting beds for more than twenty four (24) hours or percolation of less than one inch per hour shall be brought to the attention of the Owner.

2. Notify the Landscape Architect in writing of all soil or drainage conditions Contractor considers detrimental to growth of plant material.

3. If rock, hardpan, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits and beds, alternate locations may be selected by Landscape Architect. Where locations cannot be changed, submit cost required to remove the obstructions to a depth of not less than 6 inches below the required pit or bed depth. Proceed with work after approval.

3.3 PREPARING PLANT MATERIALS FOR PLANTING:

1. Canned stock shall be removed carefully after cans have been cut on two sides with approved cutter. Do not use spade to cut cans. Do not lift or handle container plants by tops, Stems, or trunks at any time.

2. Do not bind or handle any plant with wire or rope at any time so as to damage bark or break branches. Lift and handle plants only from bottom of ball.

3.4 INSTALLATION OF BED PLANTED MATERIALS:

1. Fill all shrub and groundcover beds with plant bed mix to finished grade (compacted).

2. Excavate in planting mix for individual plant and install as required. Set plant plumb and brace rigidly in position until planting soil mix has been tamped solidly around the ball and roots.

3. When plant pits have been backfilled approximately two-thirds (2/3) full, place Agriform tablets evenly distributed in plant pits according to the following schedule:

1 gallon equivalent - 1 tablet
5 gallon equivalent - 2 tablets

4. Water thoroughly, saturating root ball, before installing remainder of the planting soil to top of pit, eliminating all air pockets. Top of root ball shall 2 inches above finished grade.

5. Smooth planting areas to conform to specified grades after full settlement has occurred. Contractor shall bear final responsibility for proper surface drainage of planted areas.

6. Water all plants immediately again after planting.

7. Apply pre-emergent weed control material over entire area to receive mulch.

8. Mulch all shrub and groundcover beds as detailed on Drawings.

3.5 SURFACE DRAINAGE OF PLANTING AREAS

1. Contractor shall bear final responsibility for proper surface drainage of planted areas. Any discrepancy in the Drawings or Specifications, obstructions on the site, or prior work done by another party which Contractor feels precludes establishing proper drainage, shall be brought to the attention of Landscape Architect in writing for correction or relief of said responsibility.

3.6 PRUNING

1. Prune containerized plants only at time of planting and according to standard horticultural practice to preserve the natural character of the plant. Prune by removing entangled branching and by removing crotches. Avoid removing branch tips wherever possible. Pruning to be done under supervision of the Landscape Architect.

2. Remove all dead wood, suckers, and broken or badly bruised branches. Use only clean, sharp tools.

3. Paint cuts over 3/4- inch diameter with tree paint, covering all exposed, living tissue.

3.7 STAKING

1. Staking of trees is to be used by the Contractor, who will be responsible for material remaining plumb and straight for all given conditions through the guarantee period. Tree support shall be done as outlined on the following tables.

2. Staking shall be completed immediately after planting. Plants shall stand plumb after staking.

3. Stake all trees in accordance with the following table:

Tree	No. of Stakes	Stake Size
30 Gal. and B&B	3	7 ft. T-Post
45 Gal. to 100 Gal.	3	8 ft. T-Post

4. Machine moved trees do not require staking or guying.

5. Locate first stake on prevailing windward side of tree and as close to the main trunk as is practical, avoiding root injury. Stakes shall be driven at least 18 inches into firm ground.

6. Tie tree to stake using approved tree tie. Tie shall be located midway within tree crown or at a location approximately two-thirds (2/3) of the overall height of the tree. Locate tie just above major side branch in order to deter slippage of tie.

7. Locate second stake opposite first. Secure with one tie opposite upper tie at first stake.

8. Where used, stakes shall be equally spaced around the tree and placed equal distances from the trunk.

9. Auxiliary stem stakes shipped with trees shall be removed after shipping.

3.8 CLEANING

1. Clean all areas as required for complete and acceptable inspection.

3.9 INSPECTIONS:

1. Make written request for inspection after planting operations are completed.

2. Submit requests for inspections to the Owner at least two (2) days prior to anticipated inspection date.

3.10 PLANT MAINTENANCE

1. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

2. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.

3. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION 329313

SECTION 329400
LANDSCAPE PLANTING ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

1. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete exterior Landscape Planting Accessories installation, as shown in the Contract Drawings, and as specified herein this Section.

2. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   a. Mulches (wood products).
   b. Tree Root Aeration Units (a.k.a. Tree Chimney's).
   c. Root Control Barriers.
   d. Stakes and Guys.
   e. Erosion Control Materials.
   f. Landscape Edgings (Headers/Edgings/Mowstrips).
   g. Weed Control Barrier / Geotextile Filter Fabric.
   h. Miscellaneous Materials (Herbicides, Vitamin Stimulant/Root Hormone, etc.).

3. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   a. Section 312219 – Landscape Grading.
   b. Section 329113 – Soil Preparation.
   c. Section 329200 – Lawns & Grasses.
   d. Section 329300 – Exterior Plants.
   e. Section 329813 – Landscape Establishment Period.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

1. References:
   a. ASTM - American Society for Testing and Materials.
   b. ANSI – American National Standards Institute.

2. Definitions: (Not Used).

3. Measurements:
   a. PSI: Measurement, in pounds per square inch.
   b. CU/FT: Measurement, in cubic-foot.
   c. PPM: Measurement, in parts per million.

1.3 SUBMITTALS

1. General: Submit each item in this Article in four (4) bound Submittal Booklets, and four (4) sets of Material Samples for review by the Landscape Architect.

2. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified and legible (through yellow highlighter or other specific identification methods) information indicated herein this Article.

3. Product/Material Data. Submit available product/material literature (including color charts) supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.

4. Material Samples: For each type of material specified herein, provide Material Samples for review by the Landscape Architect. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled plastic bags (as applicable):
   a. 0.50 cubic foot of Landscape Mulch Material (Shredded Wood Mulch).
   b. One (1) two-foot (2'-0") long section of Tree Root Aeration Unit assembly.
   c. One (1) two-foot (2'-0") long sample of Root Control Barrier.
   d. One (1) set of Tree Tying/Staking Materials for each type used, as applicable.
   e. One (1) set of Tree Guying Materials for each type used, as applicable.
   f. One (1) two-foot (2'-0") length of Vine Support Tape, and one (1) Vine Support Anchor, as applicable.
   g. One (1) two-foot (2'-0") square sample of Erosion Control Material for each type used, as applicable.
   h. One (1) two-foot (2'-0") sample of Landscape Edging Materials and Accessories (stake, etc), to verify gauge, size, and color selected, as applicable.
   i. One (1) two-foot (2'-0") square sample of Weed Control Barrier / Geotextile Filter Fabric for each type used, as applicable.

5. Scaled Shop Drawings: Not Required.

6. Field-Constructed Mock-ups: Not Required.

7. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.

8. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested. Partial Submittals will not be accepted.

9. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE AND CONTROL

1. Installer Qualifications:
   a. Requirement: Valid Texas (Landscaping Contractor) License.
   b. Engage an experienced Installer who has completed Landscape Planting Accessories work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.
   c. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

2. Observation: Landscape Architect may observe installation of Landscape Planting Accessories at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Landscape Planting Accessories for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Accessories immediately from Project site.

3. Manufacturer’s Directions: Follow Manufacturer’s directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings and Contract Specifications.

4. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing services, and inspections necessary to perform and complete Work under this Section.

5. Single-Source Responsibility: Obtain each color, type, and variety of products/materials from a single source with resources to provide products/materials of consistent quality in appearance and physical properties without delaying Work.

1.5 DELIVERY, STORAGE, AND HANDLING

1. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. Deliver and store perishable material in original, unopened packaging. It is the responsibility of the Contractor to install “factory condition” Units.

2. Damaged Materials: Be responsible for all damage or disfiguration of Work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected materials.

3. Deliver materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

1. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

2. Excavation: When conditions detrimental to installing Landscape Planting Accessories are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease installation operations and notify Landscape Architect for further direction.

3. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.

4. Installation: Perform installation of Landscape Planting Accessories only when weather and soil conditions are suitable in accordance with locally accepted practices.

5. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 SUBSTITUTIONS

1. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

2. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

3. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

4. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.8 LANDSCAPE ESTABLISHMENT PERIOD

1. Refer to Section 329813 – Landscape Establishment Period, for requirements under this Article.
   a. During the duration of the Landscape Establishment Period, continuously maintain Landscape Planting Accessories by tightening, holding plumb, and/or repairing Staking and/or Guying supports, providing adequate depths and coverage requirements of Landscape Mulching Materials, monitoring drainage within Tree Root Aeration Units, hold Edging Materials true and in proper alignments, and other requirements, as required, to establish healthy, viable landscape planting materials until Final Acceptance of Work is granted.

PART 2 - PRODUCTS

2.1 LANDSCAPE MULCH MATERIALS

1. Shredded Wood Mulch: Shredded Wood Mulch, free from deleterious materials, debris, and weed seed. Suitable as a top dressing of trees, shrubs and groundcovers, consisting of following:
   a. Type: Shredded cedar, redwood, fir, or hardwood commercial wood bark products, composted with humus and leaf materials. Shredded Wood Mulch shall be graded and to average dimensions of one-inch (1”) to three-inches (3”) in length, and flat in cross-section.
      1) Minimum organic matter content at 80%.
      2) pH between 5.0 and 8.0.
      3) Salt content shall be less than 4 millimho/cm @ 25 ˚ C. on a saturated paste extract.
      4) Boron content of the saturated extract shall be less than 1.0 parts per million.
      5) Calcium carbonate shall not be present.
      6) Carbon:Nitrogen ratio is less than 100:1.
      7) Compost shall be aerobic without malodorous presence of decomposition products.
      8) Maximum particle size shall be 2 inches. A maximum of 5% shall pass a No. 2 screen.
      9)

Maximum Total Permissible Pollutant Concentrations (in parts per million (PPM)) on a dry weight basis:	
Arsenic	20 ppm
Molybdenum	30 ppm
Cadmium	15 ppm
Nickel	50 ppm
Chromium	150 ppm
Selenium	25 ppm
Cobalt	50 ppm
Silver	10 ppm
Copper	150 ppm
Vanadium	50 ppm

Lead	150 ppm
Zinc	150 ppm
Mercury	10 ppm

b. Coverage depth:
   1) Refer to Part III indicated herein this Section.
c. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following: <<OTHERS??>>
   1) *ES-2 Mulch*, Agromin Horticultural Products.
   2) *Pacific Mulch*™, Greenways Environmental.
   3) *Walk-On Chips*, Earthworks Soil Amendments, Inc.
   4) *Landscape Mulch,* Agri Service, Inc.
   5) *Red Fir Bark*, Greenway Compost.
   6) *A-1 Oak Deco Chips*, Hanson Aggregates/A-1 Soils.
   7) *#SBM 3, Special Mulch #3*, Plants Choice, Inc.
   8) Or equal, as approved by the Landscape Architect.

2.2 TREE ROOT AERATION UNITS (TREE CHIMNEY'S)

1. General: Tree Root Aeration Units are a complete assembly, consisting of a perforated Aeration Pipe Tube, wrapped in Geo-textile Filter Fabric sleeving, and topped with a Grate.

2. Aeration Pipe Tube: Manufactured from high-density polyethylene (HDPE) resin, meeting ASTM F810. Pipe shall be perforated with machine-drilled holes, set either with 3/8" holes on 4" centers at 120 degrees, or on-half-inch (½") holes on five-inch (5") centers at one-hundred-twenty (120) degrees.
   a. Length: As required, per Contract Drawings.
   b. Size (Diameter): <<<SELECT ONE>>>
      1) 3" diameter Pipe.
      2) 4" diameter Pipe.
      3) 6" diameter Pipe.
   c. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) *3000 Triple Wall Drainage Pipe*, ADS.
      2) *COEX*, PSP.
      3) *Big "O" Drainage Tubing*, Armtec.
      4) Or equal, as approved by the Landscape Architect.

3. Geo-textile Filter Fabric Sleeving for Aeration Pipe Tube: Permeable, lightweight, continuous, non-woven, UV resistant, synthetic geo-textile (nylon or polyester) filament material, engineered to allow water permeability and deter soil permittivity, per ASTM D4491. Fabric shall be non-biodegradable, resistant to acids and alkalis, and sized accordingly.
   a. Length: As required, per length of Aeration Pipe.
   b. Size: As required, to sleeve (snugly fit) over the diameter of the specified Aeration Pipe tube.

c. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   1) *Drain Sock*, ADS.
   2) *Drain-Sleeve Filter Fabric*, Carriff Corporation.
   3) *Filter Fabric*, Zodiac Fabrics, Inc.
   4) *Big "O" Sock Filter*, Armtec.
   5) *Drain-Eez*, Christy's.
   6) Or equal, as approved by the Landscape Architect.

4. Aeration Pipe Grates (sized accordingly to fit snugly to the specified Aeration Pipe Tube).
   a. Shrub and Groundcover Areas: Atrium-type Grate.
      1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *4" Atrium Grate #78S (sand color),* National Diversified Sales (NDS), Camarillo, CA.
         2) Or equal, as approved by the Landscape Architect.
   b. Lawn Areas: Flat-type Grate, round in shape.
      1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *4" Round Grate #13 (green color),* National Diversified Sales (NDS), Camarillo, CA.
         2) Or equal, as approved by the Landscape Architect.
   c. Planting Containers/Pots (as required) <<<Select Size, equal to Pipe Size>>>
      1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *4" Atrium Grate #78S (sand color),* National Diversified Sales (NDS), Camarillo, CA.
         2) Or equal, as approved by the Landscape Architect.

2.3 ROOT CONTROL BARRIERS

1. Strip Plastic Root Control Barrier:
   a. General: Installed only where indicated and at approved locations. Plastic Root Control Barrier shall be a long-term root control system for trees, fully permeable to oxygen and water to sustain and direct plant growth. Plastic Root Control Barrier shall be manufactured of an extruded, high-impact black homo-polymer (polyethylene or polyolefin) plastic, with minimum 50% post-consumer recycled material, and UV inhibitors. Plastic Root Control Barrier shall be composed of a system consisting of a series of integrally-molded, self-interlocking Barrier Panels. Polystyrene- based plastic is unacceptable.
      1) Size: Each panel shall be a minimum of twenty-four-inches (24") in width and thirty-six-inches (36") in depth, extruded to a mean thickness of minimum .08 inches, with ½" to ¾" raised vertical ribs running perpendicular to the panel and spaced six-inches (6") on-center. Provide quantity as required of integrated interlocking joint panels, in lengths as required.
      2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:

1) *UB-36-2 Deep Root,* Deep Root Partners, San Francisco, CA, 800-458-7668.
2) *Root Solutions*, Vespro, Inc., San Rafael, CA, 800-554-0914.
3) *Dual Purpose Panels, .085 Thickness,* Villa Root Barrier, Inc. Lake Elsinore, CA, 800-654-4067.
4) *RP Series Root Barrier Panel,* NDS, 800-726-1994.
5) *CP Series Root Barrier Panel,* Century Products USA, 714-632-7083.
6) Or equal, as approved by the Landscape Architect.

2.4 STAKES AND GUYS

1. Tree Staking Assembly:
   a. Wooden Stake Tree Staking Assembly: Complete tree staking Unit, consisting of Lodge Pole Pine Tree Stakes with *(choose one: Tree Ties/Tree Straps/Twist Braces)*
      1) Tree Stakes: Lodge Pole Pine Wooden Tree Stake, straight shaft, shaved and cut, cleaned and bare of branches and stubs, free of loose knots, bends, splits, or bows, of uniform thickness, with a minimum diameter of either two-inches (2”) or two-one-half (2-1/2”) to three-inches (3”). Lengths shall be eight-feet (8’), ten-feet (10’) or twelve-feet (12’), as required, to adequately and firmly penetrate the sub grade and support the tree. Stake shall have a minimum ten-inch (10”) long tapered/conical driving point, and chamfered top to minimize splitting when driven. Stake shall be pressure treated (per Federal Specification TT-W-00571-J-Table 2) with an EPA-registered pesticide containing inorganic arsenic (copper chromium arsenate, meeting Federal Specification TT-W-550-Type 1) to protect it from insect attack and decay.
         1) Quantity, Size, and Length per tree:
            a) 5-gallon container stock: One (1), two-inch (2”) diameter, eight-foor (8’) long or ten-foot (10’) long (as required) Wooden Tree Stake per tree, *(Where Twist Braces are used, provide two (2) Wooden Tree Stakes).*
            b) 15-gallon container stock: One (1), two-inch (2”) diameter, 10’-0 long or 12’-0” long (as required) Wooden Tree Stake per tree. *(Where Twist Braces are used, provide two (2) Wooden Tree Stakes).*
            c) 24” box container stock: Two (2) Two-inch (2”) diameter, ten-foot (10’) long or twelve-foot (12’) long (as required) Wooden Tree Stakes per tree.
            d) >24” box container stock: Minimum two (2) two-one-half-inches (2-1/2”) or three-inches (3”) diameter, ten-foot (10’) or twelve-foot (12’) long (as required) Wooden Tree Stakes per tree.
         2) Special Circumstances: Should lengths of Wooden Tree Stakes be inadequate to satisfactorily support the tree being staked in an upright, plumb condition, Contractor shall provide Metal Stake Tree Staking Assembly as indicated herein this Article.
         3) Products & Manufacturer’s: Subject to compliance with requirements, provide products by one (1) of the following:

a) Sullivan & Mann Lumber Company, Tustin, CA.
b) BVC Tree Stakes.
c) TruStakes, 4Seasons Wood Products.
d) Or equal, as approved by the Landscape Architect.

4) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a) *Cinch-Ties*™, V.I.T. Products, Inc., Escondido, CA.
   b) *E-Z Band,* Villa Landscape Products, Lake Elsinore, CA
   c) Or equal, as approved by the Landscape Architect.
5) Tree Tie Nails: Galvanized steel roofing nails, one-one-half-inches (1-1/2") in length. Use nails in sufficient quantity to securely attach the Tree Ties to Tree Stakes.

2) Tree Straps: Non-stretch, biodegradable cotton, dyed dark-green color, one-inch (1") wide x eighteen-inches (18") long, with one-inch (1") brass grommets at each end. Break strength at 260 lbs. nominal.
   1) Quantity, Size, and Length per tree:
      a) 5-gallon container stock: Provide two (2) Tree Straps minimum for each Tree Stake provided.
      b) 15-gallon container stock: Provide two (2) Tree Straps minimum for each Tree Stake provided.
      c) 24" box container stock and larger: Provide two (2) Tree Straps minimum for each set of Tree Stakes provided.
   2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      a) *#3018 Original Treestrap*®, GCS.
      b) Or equal (no known equal).
   3) Tree Strap Wire: Smooth, galvanized annealed Steel Wire, 12 gauge. Provide Wire in adequate lengths to anchor the grommet ends of the Tree Straps to the Tree Stakes.
3) Twist Braces: Single assembly of 5/16" diameter round metal rod, twisted with a minimum 4-1/2" loop, with steel bar stock brackets welded on both ends, Round metal rod shall be encased in black vinyl UV-resistant tubing, in the lengths and sizes as indicated, to adequately support the tree to the Tree Stakes.
   1) Quantity, Size, and Length per tree:
      a) 5-gallon to 15-gallon container stock: #TB-18 (18" length, 4-1/2" loop). Provide one (1) Twist Brace minimum and two (2) Wooden Tree Stakes.
      b) 24" box container stock: #TB-24 (24" length, 4-1/2" loop). Provide one (1) Twist Brace minimum for each set of Tree Stakes.
      c) 36" box container stock: #TB-36 (36" length, 4-1/2" loop). Provide one (1) Twist Brace minimum for each set of Tree Stakes. Verify if tree caliper can accommodate the Twist Tie loop; if inadequate, provide next larger size.
      d) 42" box container stock: #TB-42 (42" length, 7-1/2" loop). Provide one (1) Twist Brace minimum for each set of Tree Stakes. Verify if tree caliper can accommodate the Twist Tie loop; if inadequate, provide Tree Guy assembly.

2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a) *Twist-Brace*™, V.I.T. Products, Inc., Escondido, CA.
   b) Or equal (no known equal).
3) Twist Brace Hardware: Galvanized steel Wood Screws, #10 x 1-1/2" in length. Provide hardware in sufficient quantity to securely attach each Twist Brace to Tree Stakes.

2. Tree Guying Hardware
   a. Tree Support Guying System (above-grade application).
      1) Pre-assembled, pre-packaged, tree anchoring system, specifically manufactured to anchor trees in a primary above-grade application. System components (sized accordingly to tree caliper) include anchors, wire rope (specify wire rope to be galvanized steel, or clear, highly visible orange, or white vinyl coated wire rope), turn buckles, tree collars, and wire rope clamps.
      2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *Duckbill Tree Anchor System*, Foresight Products, LLC, 6430 E. 49th Drive, Commerce City, CO 80022, 800-325-5360.
         2) Or equal (no known equal).
      3) Product Application:
         1) For trees up to 3" caliper, Duckbill Tree Anchor System #40DTS.
         2) For trees up to 6" caliper, Duckbill Tree Anchor System #68DTS.
         3) For trees up to 11" caliper, Duckbill Tree Anchor System #88DTS.
   b. Tree Support Root Guying System (complete below grade application).
      1) Pre-assembled, pre-packaged, tree anchoring system, specifically designed and manufactured to hold the tree's root ball in place, with only the tree protruding from the ground. System components (sized accordingly to tree caliper) include anchors, wire rope, turn buckles, tree collars, and wire rope clamps.
      2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *Duckbill Tree Anchor System*, Foresight Products, LLC, 6430 E. 49th Drive, Commerce City, CO 80022, 800-325-5360.
         2) Or equal (no known equal).
      3) Product Application:
         1) For trees up to 3" caliper, Duckbill Tree Anchor System #68RBK.
         2) For trees up to 6" caliper, Duckbill Tree Anchor System #88RBK.

2.5 LANDSCAPE EDGINGS/HEADERS/MOWSTRIPS (SELECT ONE OR MORE:)

1. Steel Edging/Header:
   a. General: Steel Edging/Header shall be in the location and size as shown on the Contract Drawings. Comply with ASTM A569, hot-rolled, standard flexible carbon steel edging, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately thirty inches (30") apart to receive stakes.

Steel Edging/Header shall be double-staked at overlap joints, and designed to receive tapered steel stakes.

1) Size: 1/4" thick, 5" wide, by 16'-0" length, with seven (7) stakes per 16' section.
2) Color/Finish: Factory-applied Sherwin Williams H68GT85 powder coat paint, electrostatically applied and oven baked. Minimum thickness to be 1.5 mils.
    1) Color: Green.
    2) Color: Brown.
    3) Color: Black.
3) Color/Finish: Factory-applied dipped galvanized finish, applied after steel landscape edging is cut to length and stake pockets are stamped, punched or welded. Galvanization shall comply with ASTM A123. Zinc coverage shall be to a standard thickness of 3.3 mil (2.0 oz/ft^2).

b. Steel Edging/Header Stakes: Steel, tapered, 15-16" minimum length, finish to match specified Steel Edging/Header. Stakes designed specifically to anchor Steel Edging/Header in place, and manufactured by manufacturer of the Steel Edging/Header for which they will be used.
c. Accessories: Standard tapered ends, corners, and splices, as required.
d. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
    1) Ryerson & Son, Emeryville, CA.
    2) *DuraEdge*®, J.D. Russell Co., Tucson, AZ.
    3) *Border King*™ (for ¼" thick stock), Border Concepts, Inc., Charlotte, NC.
    4) *Border-Guard*™ (for 3/16" thick stock), Border Concepts, Inc., Charlotte, NC.
    5) Or equal, as approved by the Landscape Architect.

2.6 WEED CONTROL BARRIER/GEO-TEXTILE FILTER FABRIC

1. Type: Permeable, lightweight, continuous, non-woven, geo-textile polypropylene filament material, UV-resistant, engineered to allow water permeability and deter soil permittivity, per ASTM D4491. Geo-Textile Filter Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. Meet AASHTO M288-96, Class 1.

2. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
    a. *Amoco 4553,* Amoco Fabrics and Fibers Company.
    b. *FX-80HS,* Carthage Mills.
    c. *C-80NW,* Contech.
    d. *180 EX,* Linq.
    e. *Geotex 801,* Propex, Inc.
    f. *TerraTex N08,* Webtec.
    g. *180N*, TC Mirafi.
    h. *3301,* Typar Landscape Products.
    i. or equal, as approved by the Landscape Architect.

2.7 MISCELLANEOUS MATERIALS

1. Water: Per ASTM C94, from potable domestic source, and free from deleterious materials such as oils, acids, and organic matter. Transport as required.

2. Stress Reducing Agent:
   a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) *Roots Concentrate*, Roots, Inc., Independence, MO.
      2) Or equal (no known equal).
   b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

3. Wetting Agent and Soil Penetrant:
   a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) *Roots NoBurn*®, Roots, Inc., Independence, MO.
      2) *Naiad-SS,*
      3) Or equal, as approved by the Landscape Architect.
   b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

4. Herbicides: EPA registered and approved, from the following:
   a. Non-Selective Post-Emergent Herbicide: Spray-applied solution containing a minimum of 41% of the active ingredient "glyphosate" (full strength), with a surfactant, mixed with water accordingly per the Manufacturer's directions.
      1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *Roundup® PRO*, (41% glyphosate), Monsanto Company, St. Louis, MO.
         2) *Roundup® PRO* Concentrate (50% glyphosate), Monsanto Company, St. Louis, MO.
         3) *Honcho® Plus,* (41% glyphosate), Monsanto Company, St. Louis, MO.
         4) *High Yield® Kill-Zall Weed & Grass Killer,* (41% glyphosate),Voluntary Purchasing Groups, Boneham, TX.
         5) Or equal, as approved by the Landscape Architect.
      2) Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.
   b. Selective Pre-Emergent Herbicide (Packaged dry material application): Pre-emergent control of annual grasses and broadleaf weeds in turf grass areas, and woody ornamental trees, shrubs, vines, and groundcover areas. Product to contain the active ingredient "trifluralin".
      1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) *Ronstar® 2G*, (granular), Aventis Environmental Science USA.
         2) *Snapshot® 2.5 GT* (granular), (2% trifluralin), Dow AgroSciences LLC.
         3) *Treflan® HFP* (43% trifluralin), Dow AgroSciences LLC.
         4) *Treflan® TR-10,* (10% Granular trifluralin), Dow AgroSciences LLC.

5) *Surflan®,* Dow AgroSciences, LLC.
6) Or equal, as approved by the Landscape Architect.

2) Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

c. Selective Post Emergent Herbicide: Pre-mixed, flow-able formulation designed for product stability, uniformity in the spray solution and ease of handling. Post-emergent control of annual grasses, nutsedge, and broadleaf weeds in turf, generally with one (1) application.

1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
1) Trimec® Plus.
2) Ornamec® 170 Grass Herbicide.
3) Or equal, as approved by the Landscape Architect.

2) Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

5. Plant Vitamin/Hormone Stimulant:

a. Provide in a diluted liquid solution with water, at the time of watering-in recently planted plant species.

1) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
1) *SUPERthrive*, Vitamin Institute.
2) *Roots2*, Roots, Inc., Independence, MO.
3) *Root-Maxx Plus*, Bio-Plex, Mt. Joy, PA.
4) Or equal, as approved by the Landscape Architect.

2) Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

PART 3 - EXECUTION

3.1 GENERAL

1. Installation practices of the Landscape Planting Accessories shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practice, as approved by the Landscape Architect. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

2. Examination: Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of Work of this Section. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL ALL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED AND APPROVED, IN WRITING. DO NOT PROCEED WITH INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3. Prior to Work in this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and as required, to the point where the installation of the Landscape Planting Accessories may commence properly.

3.2 PROTECTION OF SITE

1. Contractor shall protect existing and new improvements and systems installed prior to installation of Landscape Planting Accessories. Maintain protection in place until completion of Work and Landscape Establishment Period.

3.3 INSTALLATION OF TREE ROOT AERATION UNITS (TREE CHIMNEY'S)

1. General: Tree Root Aeration Unit(s) shall be installed after excavation of planting hole and prior to placement of Amended Planting Backfill Mixture.

2. Upon completion of excavation of planting hole, auger a twelve-inch (12") diameter hole at the edge of the excavation. Depth shall extend two-feet (2') beyond the compacted setting layer crown of native planting soil. Remove excess soil.

3. Pipe Installation: Slide Geo-Textile Filter Fabric Sleeve over full length of Perforated Aeration Pipe Tube. Secure open end (as set in bottom of hole) of Filter Fabric Sleeve with a knot or pipe wrap tape. Place assembly Unit plumb, in vertical position, in the bottom of the augered hole. Set the top of the Unit ½" above the finished surface elevation of the mulch layer.

4. Set Plant Material accordingly, and backfill the planting hole with Amended Planting Backfill Mixture, being careful not to provide backfill within the inside of the Tree Root Aeration Unit assembly.

5. Attach Aeration Pipe Grate to top end of the sleeved Aeration Pipe Tube extending above grade. Provide appropriate Pipe Grate indicated for the application.

6. Quantity Schedule:
   a. Provide one (1) Tree Root Aeration Unit assembly for each tree up to but not including a 24"-box container size.
   b. Provide two (2) Tree Root Aeration Unit assemblies located at opposing sides of the root ball and at opposite ends of the Tree Stakes and/or Deep Watering Bubblers, for each tree sized at 24"-box container and up to but not including a 48"-box container size.
   c. Provide three (3) Tree Root Aeration Unit assemblies, located equidistant along the sides of the root ball, for each tree sized at 48"-box container and larger.
   d. Location: Coordinate location of Tree Root Aeration Units to be set equally and in between locations designated to receive deep watering irrigation bubblers, where applicable.

3.4 INSTALLATION OF STRIP ROOT CONTROL BARRIERS

1. Plastic Root Control Barrier Panels:
   a. Verify the location of underground utilities prior to placement of Root Control Barrier Panels.
   b. Excavate sub grade to the required depth of the Panel, and install Panels as an interconnected, linear system, with the ribs of the Panels vertically aligned and facing towards the Plant Material's root mass.
      1) Install Root Control Barrier Panels along the entire perimeter edge for trees located in raised planters (as required).
      2) Install Root Control Barrier Panels along the entire perimeter edge of the planting area for trees located in parking lots (as required).
      3) Install Root Control Barrier Panels for trees where the tree trunk is located within a minimum of seven-feet (7') of paved surfaces (sidewalks, curbs, plazas, etc).
         1) Root Control Barrier Panels shall extend a minimum of ten-feet (10') from either side of the tree trunk, and follow along the profile of the paved surface being protected. Install Panels at a maximum of four-inches (4") to six-inches (6") from the edge of the paved surface.
      4) Install Root Control Barrier Panels in specific locations as indicated on the Contract Drawings.
   c. Install Root Control Barrier Panels plumb, or if conditions allow, with the top of the Panel slightly inclined towards the root mass. DO NOT install with the top inclined away from the root mass.
      1) DO NOT install Root Control Barrier Panels in a circular pattern that encloses the root mass, thus restricting future growth of the Plant Material's root system.
   d. Set top of the Root Control Barrier Panels at the finish graded surface, just below the mulch layer. Install per the requirements of the Manufacturer.

3.5 STAKING AND GUYING

1. General: Tree Staking and Tree Guying shall be per the direction of the Landscape Architect. Staking and/or guying of trees shall be completed immediately following tree planting operations.
   a. Contactor shall provide new Tree Stake or Tree Guy assemblies; reconditioned or previously-used Tree Stake or Tree Guy assemblies shall not be permitted. Provide one (1) set of Tree Staking materials or Tree Guying materials per tree, as required. Trees shall remain plumb and straight from installation through the Contractor Warranty period. Staking and Guying assemblies shall remain the property of the Owner.

2. Staking/Guying Methodology: Unless otherwise directed on the Contract Drawings or as directed by the Landscape Architect based on field conditions, provide the following Staking/Guying Assemblies, as measured by the size of the tree being supported:
   a. 5-gallon size Container Stock to 36"-Box Tree, or for trees up to 3" caliper: Provide Staking Method. Number of stakes per tree shall be as directed herein this Section.
   b. For trees larger than 36"-Box size or over 3" caliper: Provide Staking or Guying Method, or as directed by the Landscape Architect.

c. Multi-trunk Trees: Provide Tree Guying Method, or as directed by the Landscape Architect.
d. Specimen-size Trees: Provide Tree Guying Method, or as directed by the Landscape Architect.

3. Tree Staking Method:
   a. Double Tree Stakes (Wooden or Metal):
      1) Locate Stakes at the closest point to the main trunk as possible, yet outside of the root ball and tree branch canopy.
      2) Firmly drive the tapered end of one (1) of the Stakes plumb into the undisturbed native sub-grade, perpendicular to the side of the prevailing wind, at the minimum depth indicated in the Contract Drawings, or deeper, as required, to firmly support the Stake and minimize any movement of the Stake. Do not damage the tree trunk or branch canopy, nor penetrate the root ball with the Stake. Do not damage or splinter the Stake.
      3) Install the other Stake in similar fashion, directly opposite from the first Stake (180 degrees), and equidistant from the tree trunk.
      4) Installed Stakes shall not touch the trunk nor branch canopy of the tree.
   b. Tying to Tree Stakes (Wooden or Metal):
      1) Tree Straps: Wrap and twist the Tree Strap around the tree trunk, at the lowest point where the tree gains the highest support, per the direction of the Landscape Architect. Secure the Strap with wire; thread the wire through the grommet ends of the Strap and twist wire to secure. Wrap other end of wire around the Stake, twist, and secure it to the Stake. (For Metal Stakes, thread wire through holes drilled through the stake). Repeat for other Stake(s), as required. For trees requiring multiple tree straps, locate additional straps as required along the tree trunk to provide additional vertical support. Cut off and bend back excessive wire beyond the twists to the Stake(s) to provide a safe condition. The tree shall be supported accordingly to assure a straight, firm position of the tree canopy, yet to allow enough slack to avoid rigid restraint of the tree.
      2) Once the tree is thoroughly staked, carefully remove the nursery stake(s). Backfill and tamp the nursery stake void(s) with planting soil.

4. Tree Guying: Install guying assembly per the Manufacturer’s latest printed instructions.

3.6 INSTALLATION OF LANDSCAPE EDGINGS (HEADERS/EDGINGS/MOWSTRIPS)

1. General: Install in location(s) in solid undisturbed soil, or in soil set at ninety-percent (90%) relative compaction, at areas as indicated on the Contract Drawings.
   a. Horizontal Alignments:
      1) Straight Alignments: Where indicated on the Contract Drawings, install Landscape Edgings in straight/angular sections, true to the alignments as indicated, free of “wiggles” or bends, using strings as guides.
      2) Curved Alignments: Where indicated on the Contract Drawings, install Landscape Edgings in curved,/radial sections, true to the alignments as indicated, free of “wiggles” or bends, following marked alignments as reviewed in the field by the Landscape Architect.

b. Vertical Alignments: Install parallel to and following along the contoured finished grade.
c. Refer to Section 321323 – Site Concrete, for Edging/Header installation requirements constructed with concrete-based materials.
d. Refer to the Manufacturer's latest printed instructions and Contract Drawings for requirements of Landscape Edgings/Headers fabricated from metal materials.

3.7 MULCHING

1. General: Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

2. Shredded Wood Mulch:
   a. General: Verify locations to receive Shredded Wood Mulch.
   b. Apply the following average thickness of Shredded Wood Mulch, and finish level with adjacent finished surfaces. Do not place Shredded Wood Mulch directly against trunks or stems of Plant Materials. Remove Shredded Wood Mulch that is placed against the growing bases or within the basal nodes of plants.
   c. Thickness/Depth: Three-inches (3"), minimum. <<<VERIFY>>>
   d. While settlement and/or decomposition of the Shredded Wood may occur during the duration of the Contract, the Shredded Wood Mulch thickness as indicated shall be consistent throughout the duration of the Contract. The Contractor shall provide additional Shredded Wood Mulch, as needed, and as directed by the Landscape Architect, to maintain the specified constant thickness of the Shredded Wood Mulch, until Acceptance of Work is granted.

3. Decomposed Granite Mulch: <<<VERIFY IF ON PROJECT>>>
   a. Refer to Section 321513 – Decomposed Granite Paving for installation requirements.

4. Aggregate Surfacing: : <<<VERIFY IF ON PROJECT>>>
   a. Refer to Section 321500 – Aggregate Surfacing for installation requirements.

3.8 INSTALLATION OF MISCELLANEOUS MATERIALS

1. Anti-Dessicant: Apply using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
   a. When deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again two (2) weeks after planting.

2. Stress Reducing Agent: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

3. Wetting Agent & Soil Penetrant: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

4. Herbicides: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

5. Plant Vitamin/Root Stimulant: Apply, per the Manufacturer's latest printed instructions. Refer to application requirements per Section 329300 – Exterior Plants.

3.9 CLEAN UP AND PROTECTION

1. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

2. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and landscape establishment periods. Treat, repair, or replace damaged Landscape Planting Accessories as directed.

3. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section and directed by the Landscape Architect.

3.10 FINAL REVIEW

1. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. (Refer to Section 329813 – Landscape Establishment Period for requirements).

END OF SECTION 329400 – LANDSCAPE PLANTING ACCESSORIES

SECTION 329813
LANDSCAPE ESTABLISHMENT PERIOD

PART 1 GENERAL

1.1 SUMMARY

1. Section includes requirements for 90-day landscape maintenance for the following:
   a. Watering trees and grass.
   b. Monitoring adjustment and minor repair of the landscape irrigation system.
   c. Mowing, edging and trimming of lawn areas.
   d. Monitoring, fertilizing, weeding, and cultivating of lawn areas.
   e. Pruning and trimming of plant material.
   f. Weed, cultivating and cleaning of planting beds.
   g. Application of fertilizers, insecticides, and herbicides.
   h. General site clean up; removal of trash and products of maintenance.
   i. Replacement of trees, shrubs, groundcovers, sod and hydromulch.
   j. Sediment removal from bayou high water.
   k. Extra services as needed.

2. Related Sections

   a. Lawns and Grasses - Section 32 92 00
   b. Trees, Shrubs, and Ground Covers - Section 32 93 13
   c. Planting Irrigation – Section 32 84 00

1.2 DEFINITIONS

1. Backfill: The earth used to replace or the act of replacing earth in an excavation.

2. Finish Grade: Elevation of finished surface of planting soil.

3. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

4. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

5. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

   Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.3 EXTRA SERVICES

1. All services not covered under this contract shall be considered "extra services" and will be charged for separately according to the nature of the item of work. The consent and authorization of the Owner or their authorized representative must be obtained prior to the performance or installation of such "extra services" items and prior to purchase of any chargeable materials.

2. Plant replacements as a result of flood damage.

1.4 MAINTENANCE REQUIREMENTS

1. Maintenance period shall begin upon inspection and approval at Substantial Completion by phase and shall be for ninety (90) days.

2. Sprinkler Irrigation System: Maintenance of the sprinkler irrigation system shall consist of monitoring and adjustment of the duration and frequency of the watering schedule, adjustment of heads for coverage and elevation, repair of leaks in both mains and lateral lines and all other work required to establish a complete working sprinkler irrigation system.

3. Trees, Shrubs, Groundcovers and Vines: Maintenance of new planting shall consist of watering, cultivating, weeding, mulching, re-staking, tightening and repairing of guys, resetting plants to proper grades or upright position, restoration of the planting saucer, and furnishing and applying such sprays and invigorants as are necessary to keep the plantings free of insects and disease and in thriving condition.

4. Lawns: Maintenance of new lawns shall consist of mowing, edging, raking, watering, weeding, fertilizing, and repair of all erosion reseeding, resodding, necessary to establish a uniform stand of the specified grasses.

1.5 PROTECTION

1. Protect planting areas and lawns at all times against damage of all kinds for duration of maintenance period. Maintenance includes temporary protection fences, barriers and signs as required for protection. If any plants become damaged or injured, because sufficient protection was not provided, treat or replace as directed by Owner at no additional cost to Owner.

1.6 NEGLECT AND VANDALISM

1. Turf, shrubs, trees or plants that are damaged or killed due to contractors operations, negligence or chemicals shall be replaced at no expense to the Owner. If plant damage or death is caused by conditions beyond the contractor’s control, replacement shall be at the Owner’s expense.

2. Sprinklers or structures that are damaged due to the contractor's operations must be replaced by the contractor promptly. Likewise, damage to the irrigation system by others shall be corrected immediately by the contractor, at the Owner's expense.

3. All man made water damage, resulting from Contractor's neglect shall be corrected at Contractor's expense.

4. All damage to or thefts of landscaping and irrigation installations not caused or allowed by the contractor shall be corrected by the contractor at the Owner's expense upon receipt of written authorization to proceed.

1.7 EMERGENCIES

1. Answer emergency or complaint calls regarding conditions in landscaped areas regarding fallen trees or branches or shrubs or trees that obstruct the trail or other pavement within 1 hour and correct the problem or place warning signs and advise the Owner of the need for major work to be performed within 4 hours of the initial contact.

2. Answer emergency calls regarding the landscape irrigation system failure or need of repair.

1.8 FINAL ACCEPTANCE

1. Work under this Section will be accepted by Owner's representative upon satisfactory completion of all work, including maintenance, but exclusive of the required guaranteed sprinkler irrigation obligations, replacement of plant materials and lawns under the Warranty Period. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

PART 2 PRODUCTS

2.1 MATERIALS

1. Materials required for installed items shall match those already in use.

2. Samples of all materials not specified under other Sections of these Specifications shall be submitted for review by Owner's representative prior to use.

PART 3 EXECUTION

3.1 REQUIRED EQUIPMENT

1. Provide the necessary maintenance equipment.

3.2 WATERING

1. It shall be the responsibility of the Contractor to assure that the correct watering of plant materials is being accomplished through the following irrigation services:

    a. Regular deep watering to all new trees until there are definite signs that the trees have established themselves and new growth is apparent. Deep watering shall be accomplished with hoses and water truck equipment.
    b. Frequent watering to the lawn areas to insure against drying. This may be accomplished as above, by hand watering or portable sprinklers.

3.3 LANDSCAPE IRRIGATION SYSTEM

1. Monitor and program the automatic controlling devices to provide optimum moisture levels in all planted areas.

    a. Irrigation cycles shall be set to take place prior to sunrise (usually 4:00 - 5:00 am) unless otherwise instructed by the Owner, except during visits of grounds maintenance personnel; during such visits the irrigation system may be operated as desired by those personnel.
    b. If there is more than one irrigation controller, do not program to water during the same time period as over-draft of water meters will result. Set controllers so that one finishes watering cycle before next starts watering cycle. During periods of high rainfall, set controllers to "dry mode" until irrigation is needed. Do not switch controller to "off", as this will stop time clock.
    c. Complete sprinkler system servicing shall be performed as required to maintain sprinklers in correct operating condition, including all required labor. Operation of sprinklers shall be monitored on a bi-monthly basis to assure proper cover and operation.
    d. Adjust sprinklers to avoid damage to windows and buildings. Make repairs and alterations to the sprinkling system and water lines. All sprinklers repairs such as cleaning of heads or breaks caused by the Contractor shall be the Contractor's responsibility.
    e. Perform minor additions, subtractions and/or adjustments to irrigation equipment (i.e., addition of spray head or riser extension) as may be required to order to conform to the irrigation requirements herein specified. Such additions, subtractions and/or realignments to irrigation system equipment shall not materially reduce the extent or value of the irrigation system equipment, and shall be accomplished after securing approval of the Owner.
    f. Supplemental irrigation beyond that which can be provided by the irrigation system shall be provided by the grounds maintenance firm as required in order to assure optimum moisture levels.
    g. Sediment removal from project site as a result of bayou tide rising and receding by use of project stand pipes.

3.4 MAINTENANCE OF TURF AREAS

1. Mowing lawn/grass areas shall be accomplished with sharp, properly adjusted mowers of the correct size for the various areas.

2. Mowing frequency shall be as per the Landscape Maintenance Program. Blade heights shall be set according to the following schedule:
   2 Inches Initial Mowing
   2 Inches April - November

3. In the event of a prolonged rainy period and a surge of leaf growth is anticipated, the mower height may be re-adjusted to prevent "scalping" or skinning of lawn on preceding cuts.

4. Lawn shall be edged evenly at all walks, headers and other structures as per Landscape Maintenance Program.

5. Until the establishment of the turf, the Contractor will be responsible for replacing soils that have eroded onto the paved areas. Residual soils on paving will be removed and if not mingled with objectionable materials, may be re-used in eroded areas.

6. Immediately upon observing any lawn grass spreading into shrub or groundcover areas, the Contractor shall initiate a program of mechanical removal and maintain this program throughout the maintenance period.

7. Any lawn grass appearing in paved areas shall receive an application of soil sterilant according to manufacturer's direction. The sterilant shall be approved and will not be detrimental structurally to paved areas.

8. Special effort shall be given to the control of fire ants infesting the site. After control is accomplished, the ant mounds shall be lowered and tamped to the existing grade.

9. Removal of debris from the site unrelated to horticultural maintenance (paper, bottles, cans, "Pirate" signs, etc.) shall be the responsibility of the maintenance Contractor and limited to areas designated.

3.5 MAINTENANCE OF TREES, SHRUBS, AND GROUNDCOVERS

1. Contractor shall adjust and tighten as required all tree staking and guying. Removal as directed by Owner's Representative.

2. Contractor shall deep water all new trees until there are definite signs the trees have established themselves and are pushing out new growth.

3. Watering basins shall be removed by Contractor after the trees have established themselves or as directed by Owner's representative. Basins are normally removed one year from time of planting.

4. Contractor shall be continuously alert for signs of insect presence or damage or the presence or damage from plant fungi. Upon locating such evidence, the Contractor shall report it to the Owner's representative and take action as directed.

3.6 MAINTENANCE FREQUENCY SCHEDULE

1. Mowing, Edging, Trimming, Litter Cleanup, and Watering Monitoring: Four visits per month for 90 days.

2. Topdress Fertilizer: Thirty days after seeding and/or sodding.

3. Mulching, Weeding, Weed Control, and Guying Adjustment: As required each visit.

4. Reseeding: As required upon notice.

5. Tree and Plant Replacement: As required each visit.

6. Trash and Debris Removal: Collect all trash and debris at each visit and dispose of off-site.

END OF SECTION

SECTION 33 05 16
UTILITY STRUCTURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. REFERENCE STANDARDS:

1. Cast-in place concrete structures.

2. Precast concrete structures.

3. Metal components.

1.02 RELATED SECTIONS

A. Concrete formwork, concrete reinforcement, cast-in-place concrete, Portland cement concrete, concrete repair and finishing, and precast concrete are specified in the various Sections under Division 3 - Concrete.

B. Interior trench drains and gratings for interior uses are specified in Section 05 50 00 - Metal Fabrication.

C. Duct banks are specified in Section 20 50 16 - Underground Ductwork and Structures for Facility Services.

1.03 MEASUREMENT AND PAYMENT

A. General: Measurement and payment for utility structures will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for utility structures indicated in the Bid Schedule of the Bid Form.

B. Lump Sum: If the Bid Schedule indicates a lump sum for utility structures, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, Article 1.03.

C. Unit Price: If the Bid Schedule indicates a unit price for utility structures, the unit-price method of measurement and payment will be as follows:

1. Measurement:
    a. Cast-in-place concrete and precast concrete units or structures and metal curb-and-gutter inlets will be measured for payment by the individual unit (each), installed in place. Each different type and size of concrete unit or structure will be measured separately for payment.

b. Manhole covers and frames, grates and frames, pipe inlets and outlets, manhole steps, ladders, miscellaneous metal, reinforcing steel, and grounding will not be measured separately for payment, but will be included as part of the utility structure to which it is attached or embedded.

RELEASE - R1.2 SECTION 33 05 16 BART FACILITIES STANDARDS SAVE DATE: 8/19/2004 10:17 AM PAGE 1 OF 7 STANDARD SPECIFICATIONS

c. Excavation and backfill for utility structures will be measured separately for payment as specified in Section 31 00 00 - Earthwork, as applicable.

2. Payment: Utility structures will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1, herein.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A36/A36M Specification for Structural Steel
2. ASTM A48 Specification for Gray Iron Castings
3. ASTM A108 Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
4. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A536 Specifications for Ductile Iron Castings
7. ASTM B3 Specification for Soft or Annealed Copper Wire
8. ASTM B26/B26M Specification for Aluminum-Alloy Sand Castings
9. ASTM C33 Specification for Concrete Aggregates
10. ASTM C150 Specification for Portland Cement
11. ASTM C260 Specification for Air-Entraining Admixtures for Concrete
12. ASTM C270 Specification for Mortar for Unit Masonry
13. ASTM C478 Specification for Precast Reinforced Concrete Manhole Sections

14. ASTM C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

15. ASTM C789 Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
16. ASTM C850 Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 feet of Cover Subjected to Highway Loadings

17. ASTM C858 Specification for Underground Precast Concrete Utility Structures

18. ASTM C891 Practice for Installation of Underground Precast Concrete Utility Structures

B. Texas Code of Regulations (TCR):

1. Title 24, Part 2, Texas Building Code, Chapter 21, Masonry, and State Chapter 21A, Masonry.

C. State of Texas, Department of Transportation (TXDOT):

1. Bridge Design Specifications Manual, Section 3, “Loads”

D. Underwriters Laboratories Inc. (UL):

1. UL 467 Grounding and Bonding Equipment

1.05 SUBMITTALS

A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Shop Drawings: When not indicated on the Contract Drawings in sufficient detail or definition, submit detailed drawings of cast-in-place and precast concrete utility structures and related metal work.

C. Product Data: Submit manufacturers' product data for standard manufactured precast concrete utility boxes and structures and for metal gratings and covers and other, related miscellaneous metal items.

D. Certification: Submit certification or other acceptable evidence that covers and grates to be provided for roadways and parking areas meet proof-testing requirements for H2O and HS2O loadings in accordance with TXDOT Bridge Design Specifications Manual, Section 3.

PART 2 - PRODUCTS

2.01 CAST-IN-PLACE CONCRETE STRUCTURES

A. Materials: Comply with requirements of Section 03 05 15 - Portland Cement Concrete, except as specified otherwise herein.

1. Portland Cement: ASTM C150, Type II, low alkali.

2. Cementitious Admixture: Provide fly ash or pozzolan conforming with ASTM C618, Class F or N, not to exceed 15 percent by weight of the cement content.

3. Aggregates: ASTM C33, fine aggregate and Size Nos. 56 or 57 (1-inch maximum size) coarse aggregate.

B. Mix Design: Obtain design of concrete mix as specified in Section 03 05 15 - Portland Cement Concrete, and incorporate the following requirements:

1. Concrete Strength: Class 4000 minimum in accordance with Table 03305-A of Section 03 05 15 - Portland Cement Concrete, except that electrical structures, such as vaults, pull boxes, and concrete for ductbanks, shall be Class 3000.

2. Maximum water-cement plus pozzolan ratio: 0.45.

3. Maximum slump: 4 inches.

2.02 PRECAST CONCRETE STRUCTURES

A. General: The Contractor may provide precast concrete structures that conform to the general configuration, capacities, and inverts indicated.

B. Fabrication Standards: Comply with requirements of Section 03 40 00 - Precast Concrete, and ASTM C478, ASTM C789, ASTM C850, and ASTM C858, as applicable, and applicable manufacturers' standards.

C. Materials: Comply with requirements of Section 03 20 00 - Concrete Reinforcing, Section 03 05 15 - Portland Cement Concrete, and Section 03 40 00 - Precast Concrete, except as specified otherwise herein. Provide fine and coarse aggregates conforming to ASTM C33, in size commensurate with structure and reinforcement clearances.

D. Portland Cement Concrete: Class 4000 minimum in accordance with Table 03305-A of Section 03 05 15 - Portland Cement Concrete. Concrete may be polymer or latex modified to achieve higher strengths and denser concrete. Concrete shall not deteriorate from chemical attack of sanitary waste.

1. Concrete for electrical utility structures shall be Class 3000.

E. Precast Covers: Precast covers shall have the utility identification, such as "PG&E Gas Valve," stamped into the cover.

F. Quality Control: In accordance with Section 01 45 00 - Quality Control, the Contractor shall perform such inspections and tests as required to verify compliance with these Specifications.

2.03 METAL COVERS, GRATES, AND INLETS

A. Ferrous Castings:

1. Metal used in manufacture of castings shall conform to ASTM A48, Class 35B for Gray Iron, or ASTM A536, Grade 65-45-12 for Ductile Iron.

2. Castings shall be of uniform quality, free from blowholes, shrinkage, distortion or other defects. Castings shall be smooth and cleaned by shotblasting.

3. Minimum tensile strength shall be 35,000 psi.

4. Castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Round frames and covers shall have continuously machined bearing surfaces to prevent rocking and rattling.

5. Where castings will be subjected to loads of H2O or greater, as indicated, provide ductile iron castings.

B. Aluminum Castings: Where required to reduce weights of larger covers for ease of handling,
such covers may be manufactured of aluminum castings conforming to ASTM B26/B26M, Alloy No. 713.0. Minimum tensile strength shall be 32,000 psi.

C. Manhole Covers: Provide cast, manufactured manhole covers and frames with heavy-duty solid cover (lid) or vented cover (lid) as indicated. Covers shall be embossed or engraved with nonslip diamond or square cross-hatched pattern. Provide covers with embossed or engraved word identification, as indicated or appropriate, for the enclosed or underground utility.

D. Grates:

1. Cast Ferrous Grates: Grates for area drains and catch basins shall be heavy-duty, bicycle safe inlet grates and frames of size and configuration indicated. Grates in roadways and parking areas shall withstand H20 loadings when proof-tested in accordance with TXDOT Bridge Design Specifications Manual, Section 3.

2. Bar-Type Steel Grates: Refer to Section 05 50 00 - Metal Fabrications, for requirements. Bar-type steel gratings will be permitted only in areas where vehicular traffic will not be encountered.

E. Curb and Gutter Inlets: Provide cast, manufactured curb inlet frame, grate, and curb box of size and configuration indicated. Curb and gutter inlets shall conform to the contour and profile of the concrete curb and gutter. Grates shall be heavy-duty and bicycle-safe and shall withstand H20.

F. Cast Iron Manhole Steps: Provide cast, manufactured manhole steps with cross-hatched treads and with anchor configuration appropriate for cast-in-place concrete or precast concrete as indicated. Provide steps for installation 12 inches on center in vertical alignment.

2.04 MISCELLANEOUS METAL

A. Requirements: Provide channel inserts, pulling eyes, ladders, and electrical grounding rods for electrical manholes and pull boxes as indicated.

B. Steel Materials: Standard structural sections, shapes, plates, bars, and rods, as indicated, conforming with ASTM A36/A36M. Bars conforming with ASTM 108 will be acceptable.

C. Anchors and Bolts: Conform with requirements of Section 05 50 00 - Metal Fabrications, as applicable. Bolts and studs, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A153.

D. Ladders: Provide standard-manufactured or custom-fabricated steel ladders as required to meet the conditions indicated. Steel ladders shall be hot-dip galvanized after fabrication.

E. Grounding and Bonding Materials: Conform with UL 467 and the following requirements:

1. Grounding Rods: Medium carbon steel core, copper-clad by the molten weld casting process, 3/4-inch diameter by 10 feet long in size.

2. Bare Conductors: ASTM B3, No. 1/0 AWG, Class B stranded, annealed copper conductor.

F. Fabrication: Form and fabricate the work as indicated. Include anchors, fasteners, and accessories to anchor and secure the work in place.

G. Galvanizing: All ferrous metal items shall be galvanized after fabrication by the hot-dip process in accordance with ASTM A123. Weight of the zinc coating shall conform with the requirements specified under "Weight of Coating" in ASTM A123.

2.05 MORTAR

A. Cement mortar for the sealing of openings for pipe penetrations, for cementing of

joints of component parts of precast structures, for providing of flow characteristics for the bottoms of drainage structures, and other features as indicated shall conform with the Texas Building Code, Chapter 21, Type S (without lime), with a minimum compressive strength at 28 days of 1,800 psi.

B. Mortar shall comply with applicable requirements of ASTM C270, including measurement, mixing, proportioning, and water retention. Ten percent by volume of the cement content of the mortar shall be fly ash or pozzolanic material conforming with ASTM C618.

C. Use mortar within 90 minutes after mixing. Discard mortar that has been mixed longer or that has begun to set. Re-tempering of mortar will not be permitted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Requirements: Construct manholes, junction chambers, catch basins, curb and gutter inlets, trench drains, culverts, headwalls, wingwalls, pull boxes, utility boxes and vaults, and related utility structures in connection with the installation of pipe, conduits, ductbanks, and utility trenches, as indicated.

B. Excavation and Backfill: Provide excavation, prepared subgrade and aggregate base, and backfill as specified in Section 31 00 00 - Earthwork, Section 33 05 28 - Trenching and Backfilling for Utilities, Section 32 11 17 - Aggregate Subbase Courses, and Section 32 11 23 - Aggregate Base Course, as indicated.

C. Cast-in-Place Concrete Structures: Provide formwork, steel reinforcement, and concrete in accordance with applicable requirements of Section 03 11 00 - Concrete Forming, Section 03 20 00 - Concrete Reinforcing, and Section 03 30 00 - Cast-In-Place Concrete.

D. Precast Concrete Structures: Install as indicated. Comply with applicable requirements of ASTM C891. Provide such appurtenances and installation accessories, including cement mortar and sealants, as required for a complete installation.

E. Metal Components: Install manhole covers, grates and frames, curb and gutter inlets, metal steps, ladders, channel inserts, pulling eyes, and electrical grounding rods as indicated and in accordance with the respective manufacturer's instructions. Covers and grates in roadways, parking areas, and concrete walks shall be installed flush with adjacent, abutting pavement.

3.02 FIELD QUALITY CONTROL

A. The Contractor shall perform slump tests and strength tests of cast-in-place structures in accordance with the requirements specified in Section 03 05 15 - Portland Cement

Concrete.

B. Acceptance of cast-in-place structures will be in accordance with Section 03 05 15, Portland Cement Concrete.

END OF SECTION 33 05 16

SECTION 33 05 28
TRENCHING AND BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices

1. No additional payment will be made for trench excavation, embedment and backfill under this Section. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.

2. When Project Manager directs Contractor to over excavate trench bottom, Contractor will be paid by unit price bid per linear foot under bid item - 6-inches Over Excavation of Trench Bottom.

   a. No payment will be paid if Project Manager does not direct Contractor to over excavate trench bottom.

   b. No over excavation will be measured or paid when unsuitable conditions result from dewatering system not in conformance with Section 01578 - Control of Ground and Surface Water.

3. No additional payment will be made for performing Critical Location exploratory excavation. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.

4. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price

1.03 DEFINITIONS

A. Pipe Foundation: Suitable and stable native soils that are exposed at trench subgrade after excavation to depth of bottom of bedding as shown on Drawings, or foundation backfill material placed and compacted in over-excavations.

B. Pipe Bedding: Portion of trench backfill that extends vertically from top of

foundation up to level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.

C. Haunching: Material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.

D. Initial Backfill: Portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to level line 12-inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.

E. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.

F. Trench Zone: Portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.

G. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.

2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.

3. Materials that contain large clods, aggregates, stones greater than 4-inches in any dimension, debris, vegetation, waste or any other deleterious materials.

4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

H. Suitable Material: Suitable soil materials are those meeting specification requirements. Materials mixed with lime, fly ash, or cement that can be compacted to required density and meeting requirements for suitable materials may be considered suitable materials, unless otherwise indicated.

I. Backfill: Suitable material meeting specified quality requirements placed and compacted under controlled conditions.

J. Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom. Refer to Section 01578 - Control of Ground Water and Surface Water.

K. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally

entering trench shall be controlled and removed as part of excavation drainage.

L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using drainage layer, as defined in ASTM D 2321, placed on foundation beneath pipe bedding or thickened bedding layer of Class I material.

M. Trench Conditions are defined with regard to stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.

1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.

2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.
   a. Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.

   b. Stable Wet Trench in Sandy Soils: Excavation drainage is provided in embedment zone in combination with ground water control in predominately sandy or silty soils.

3. Unstable Trench: Unstable trench conditions exist in pipe embedment zone if ground water inflow or high-water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.

N. Sub-trench: Sub-trench is special case of benched excavation. Sub-trench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of sub-trench depends upon trench stability and safety as determined by Contractor.

O. Trench Dam: Placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along trench.

P. Over-excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings and backfilled with foundation bedding.

Q. Foundation Bedding: Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material separation. Foundation bedding is placed and compacted as backfill to provide stable support for bedding. Foundation bedding materials may include

concrete seal slabs.

R. Trench Safety Systems include both protective systems and shoring systems as defined in Section 02260 - Trench Safety Systems.

S. Trench Shield (Trench Box): Portable worker safety structure moved along trench as work proceeds, used as protective system and designed to withstand forces imposed on it by cave in, thereby protecting persons within trench. Trench shields may be stacked if so designed or placed in series depending on depth and length of excavation to be protected.

T. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movement of ground affecting adjacent installations or improvements.

U. Special Shoring: Shoring system meeting special shoring as specified in Paragraph 1.08, Special Shoring Design Requirements, for locations identified on Drawings.

V. Vacuum Excavation: An excavation technique performed by an experienced subcontractor in which water or air jetting is used to slough off and vacuum away soil.

W. Large Diameter Water Line (LDWL): Water line that is 24-inches in diameter or larger. X. Emergency Action Plan (EAP): The EAP document should include a discussion of procedures for timely and reliable detection, classification (level of emergency) and response procedure to a potential emergency condition associated with a large diameter water line.

Y. Subsurface Utility Exploration (SUE): Non-destructive excavation, unless otherwise approved by project manager.

1.04 REFERENCES

A. ASTM A 798 – Standard Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications.

B. ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipelines.

C. ASTM C 891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures

D. ASTM C 1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations

E. ASTM C 1675 - Standard Practice for Installation of Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

F. ASTM C 1821 - Standard Practice for Installation of Underground Circular Precast Concrete Manhole Structures

G. ASTM D 558 - Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures.

H. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)).

I. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

J. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

K. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classifications System).

L. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

M. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

N. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

O. TxDOT Tex-101-E - Preparing Soil and Flexible Base Materials for Testing.

P. TxDOT Tex-110-E - Particle Size Analysis of Soils.

Q. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

1.05 SCHEDULING

A. Schedule work so that pipe embedment can be completed on same day that acceptable foundation has been achieved for each section of pipe installation, manhole, or other structures.

B. For proposed utility adjacent to or across existing LDWL:

1. Conduct a meeting between contractor, Drinking Water Operations and Utility Maintenance Branch prior to beginning excavation to coordinate the EAP in the event a water line shut down becomes necessary.

2. Notify Drinking Water Operations a minimum of 1 week prior to beginning construction activities.

3. Notify Drinking Water Operations a minimum of 48 hours prior to beginning SUE work near LDWL.

4. Unless otherwise approved by City Engineer, perform construction activities between 7 AM and 7 PM, Monday through Friday. No work permitted around a LDWL on weekends or City Holiday.

5. A City Inspector must be present during SUE or construction activities occurring within four feet or one diameter of the LDWL, whichever is greater, from a LDWL or appurtenance.

1.06 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.

2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.

3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information in accordance with requirements of Section 02320 - Utility Backfill Materials.

D. Submit trench excavation safety program in accordance with requirements of Section 02260 - Trench Safety System. Include designs for special shoring meeting requirements defined in Paragraph 1.08, Special Shoring Design Requirements contained herein.

E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

F. Submit 11-inch by 17-inch or 12-inch by 18-inch copy of Drawing with plotted utility or obstruction location titled "Critical Location Report" to Project Manager.

G. For installation of proposed utility adjacent to or across existing LDWL, prepare and submit the following to Drinking Water Operations prior to beginning construction activities. Obtain approval from Drinking Water Operations prior to commencing prelocate or utility work near LDWL.

1. Trench details, shoring system designs, installation sequences, and flowable fill mix designs.

2. Emergency Action Plan (EAP) to address contingency plans in the event of damage to or failure of LDWL. Include the following:

a. Contact personnel and agencies including primary and secondary telephone numbers.

b. Contractor’s hierarchy of responsible personnel.

c. Traffic control measures.

d. Identification of resources to be available on or near project site in event of damage to or failure of LDWL.

1.07 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by City in accordance with requirements of Section 01454 - Testing Laboratory Services and as specified in this Section.

B. Perform backfill material source qualification testing in accordance with requirements of Section 02320 - Utility Backfill Materials.

1.08 SPECIAL SHORING DESIGN REQUIREMENTS

A. Have special shoring designed or selected by Contractor's Professional Engineer to provide support for sides of excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by Contractor's Professional Engineer to meet project site requirements based on manufacturer's standard design.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Perform excavation with hydraulic excavator or other equipment suitable for achieving requirements of this Section.

B. Use only hand-operated tamping equipment until minimum cover of 12-inches is obtained over pipes, conduits, and ducts. Do not use heavy compacting

equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.

C. Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.

D. Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, or other systems meeting requirements as specified in Paragraph 1.08, Special Shoring Design Requirements.

2.02 MATERIAL CLASSIFICATIONS

A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Section 02320 - Utility Backfill Materials and Section 02321 – Cement Stabilized Sand.

B. Concrete Backfill: Conform to requirements for Class B concrete as specified in Section 03315 - Concrete for Utility Construction.

C. Geotextile (Filter Fabric): Conform to requirements of Section 02621 Geotextile.

D. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

PART 3 - EXECUTION

3.01 STANDARD PRACTICE

A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

B. Install rigid pipe to conform to standard practice described in ASTM C 12, C 1479, or C 1675as applicable, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

3.02 PREPARATION

A. Establish traffic control to conform to requirements of Section 01555 - Traffic Control and Regulation. Maintain barricades and warning lights for streets and intersections affected by Work, and are considered hazardous to traffic movements.

B. Perform work to conform to applicable safety standards and regulations. Employ trench safety system as specified in Section 02260 - Trench Safety Systems.

C. Immediately notify agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from Project Manager and

agency for any repairs or relocations, either temporary or permanent.

D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Section 02221 - Removing Existing Pavements, Structures, Wood and Demolition Debris, as applicable.

E. Install and operate necessary dewatering and surface-water control measures to conform to Section 01578 - Control of Ground and Surface Water. Provide stable trench to allow installation in accordance with Specifications.

F. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Section 01725 - Field Surveying.

3.03 CRITICAL LOCATION INVESTIGATION

A. Horizontal and vertical location of various underground lines shown on Drawings, including but not limited to water lines, gas lines, storm sewers, sanitary sewers, telecommunication lines, electric lines or power ducts, pipelines, concrete and debris, are based on best information available but are only approximate locations. Unless otherwise approved by Project Manager, at Critical Locations shown on Drawings, perform vacuum excavation to field verify horizontal and vertical locations of such lines within a zone 2 feet vertically and 4 feet horizontally of proposed work exclude water jetting at PCCP water line.

1. Verify location of existing utilities minimum of 7 working days in advance of pipe laying activities based on daily pipe laying rate or prior to beginning installation of auger pit or tunnel shaft. Use extreme caution and care when uncovering utilities designated by Critical Locate.

2. Notify Project Manager in writing immediately upon identification of obstruction. In event of failure to identify obstruction in minimum of 7 days, Contractor will not be entitled to extra cost for downtime including, but not limited to, payroll, equipment, overhead, demobilization and remobilization, until 7 days has passed from time Project Manager is notified of obstruction.

B. Notify involved utility companies of date and time that investigation excavation will occur and request that their respective utility lines be marked in field. Comply with utility or pipeline company requirements that their representative be present during excavation. Provide Project Manager with 48 hours notice prior to field excavation or related work.

C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot on 12-inch by 18-inch copy of Drawings. For large diameter water lines, submit to Project Manager for approval, horizontal and vertical alignment dimensions for connections to existing lines, tied into project baseline, signed and sealed by R.P.L.S.

D. LDWL Prelocate Requirements:

1. Field-locate LDWL, appurtenances and laterals connected directly to LDWL through use of non-probing method such as a vacuum truck (non-water jetting method) at no greater than 50-foot intervals. Locate upstream and downstream of proposed work or utility installation.

2. Record crown and side of LDWL adjacent to proposed work or utility installation. Record LDWL locations horizontally and vertically using same coordinate system employed on proposed utility drawings.

3. Tie horizontal and vertical coordinates into project baseline. Submit recordings performed by R.P.L.S to City a minimum of 14 days prior to mobilizing to site.

3.04 PROTECTION

A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings, and in accordance with requirements of Section 01562 - Tree and Plant Protection.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.

D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches.

Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, re-compact, and pave those areas at no additional cost to City.

E. Contingency plans for proposed work or utility installation adjacent to or across a LDWL:

1. Conduct on-site emergency drill prior to commencing proposed utility installation, and at three month intervals to assure EAP is current.

2. In the event a LDWL shut down becomes necessary, secure site and provide assistance to City personnel to access pipe and isolation valves as needed.

3.05 EXCAVATION

A. Except as otherwise specified or shown on Drawings, install underground utilities in open cut trenches with vertical sides.

B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

C. Determine trench excavation widths using following schedule as related to pipe outside diameter (O.D.). Excavate trench so that pipe is centered in trench.

Nominal Pipe Size, Inches	Minimum Trench Width, Inches
Less than 18	O.D. + 18
18 to 30	O.D. + 24
36 to 42	O.D. + 36
Greater than 42	O.D. + 48

Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.

E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify Project Manager and obtain instructions before proceeding.

F. Shoring of Trench Walls.

1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.
2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.
3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by Project Manager. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.
4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.

5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of 1-inch-thick steel plate. As sheeting is removed, fill in voids left with grouting material.

G. Use of Trench Shields. When trench shield (trench box) is used as worker safety device, the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.

2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re- compact after shield is moved if soil is disturbed.

3. When required, place, spread, and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.

4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.

5. Conform to applicable Government regulations.

H. Voids under paving area outside shield caused by Contractor's work will require removal of pavement, consolidation and replacement of pavement in accordance with Contract Documents. Repair damage resulting from failure to provide adequate supports.

I. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.

J. Coordinate excavation within 15 feet of pipeline with company's representative. Support pipeline with methods agreed to by pipeline company's representative. Use small, rubber- tired excavator, such as backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have guard installed over teeth to approximate bucket without teeth. Excavate by hand within 1 foot of Pipeline Company’s line. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by Pipeline Company’s representative.

K. When, during excavation to uncover pipeline company's pipelines, screwed collar or an oxy- acetylene weld is exposed, immediately notify Project Manager. Provide supports for collar or welds. Discuss with Pipeline Company’s representative and determine methods of supporting collar or weld during excavation and later backfilling operations. When collar is exposed, request Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.

L. Excavation and shoring requirements for proposed work or utility installation adjacent to or across a LDWL:

1. Identify LDWL area in field and barricade off from construction activities. Allow no construction related activities including, but not limited to, loading of dump trucks and material staging or storage, on top of LDWL.

2. Employ a groundwater control system when performing excavation activities within ten feet of LDWL to:

a. Effectively reduce hydrostatic pressure affecting excavations,

b. Develop substantially dry and stable subgrade for subsequent construction operations,

c. Prevent loss of fines, seepage, boils, quick condition or softening of foundation strata, and

d. Maintain stability of sides and bottom of excavations.

3. When edge of proposed trench or shoring is within a distance equal to one diameter of LDWL from outside of wall of LDWL, valve or appurtenance:

a. Maintain minimum of four (4) feet horizontal clearance and minimum of two
(2) feet vertical clearance between proposed utility and LDWL.

b. Auger Construction

1) Maintain minimum of four (4) feet horizontal clearance between proposed utility and LDWL.

2) Dry auger method required when auger hole is 12-inches and larger in diameter.

c. Open Cut Construction and Auger pits

1) Perform hand excavation when within four (4) feet of LDWL.

2) Employ hydraulic or pneumatic shoring system. Do not use vibratory or impact driven shoring or piling.

3) Expose no more than 30-feet of trench prior to backfilling.

4) A maximum of one (1) foot of vertical trench shall be un-braced at a time to maintain constant pressure on face of excavated soil.

5) Upon removal of shoring system, inject flowable fill into void space left behind by shoring system. Comply with Standard Specification 02322 - Flowable Fill.

d. When edge of utility excavation is greater than one diameter of LDWL from outside wall of LDWL, use a shielding system as required by Project Manager and proposed utility standards and practices.

3.06 HANDLING EXCAVATED MATERIALS

A. Use only excavated materials, which are suitable as defined in this Section and conforming to Section 02320 - Utility Backfill Materials. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.

B. When required, provide additional backfill material conforming to requirements of Section 02320 - Utility Backfill Materials.

C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Maintain site conditions in accordance with Section 01504 - Temporary Facilities and Controls. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

3.07 TRENCH FOUNDATION

A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

B. When wet soil is encountered on trench bottom and dewatering system is not required, over excavate an additional 6-inches with approval by Project Manager. Place non-woven geotextile fabric and then compact 12-inches of crushed stone in one lift on top of fabric. Compact crushed stone with four passes of vibratory-type compaction equipment.

C. Perform over excavation, when directed by Project Manager, in accordance with Paragraph 3.07.B above. Removal of unstable or unsuitable material may be required if approved by Project Manager;

1. Even though Contractor has not determined material to be unsuitable, or

2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating according to Section 01578 - Control of Ground and Surface Water.

D. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.08 PIPE EMBEDMENT, PLACEMENT, AND COMPACTION

A. Remove loose, sloughing, caving, or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.

B. Place embedment including bedding, haunching, and initial backfill as shown on Drawings.

C. For pipe installation, manually spread embedment materials around pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and compaction directly against undisturbed soils in trench sidewalls, or against sheeting which is to remain in place.

D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.

E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.

F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.

H. Place electrical conduit, if used, directly on foundation without bedding.

I. Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.

J. For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Section 02320 - Utility

Backfill Material. Adhere to the following subparagraph numbers 1 and 2.

1. Class I, II and III Embedment Materials:

   a. Maximum 6-inches compacted lift thickness.
   b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

   c. Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Project Manager.

2. Cement Stabilized Sand (where required for special installations):

   a. Maximum 6-inches compacted thickness.

   b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

   c. Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.

K. For Sanitary Sewers adhere to subparagraph number 1 and 2. For Storm Sewers provide cement stabilized sand per paragraph 2. This provision does not apply to Storm Sewers constructed of HDPE pipe installed under pavement.

1. Class I Embedment Materials.

   a. Maximum 6-inches compacted lift thickness.

   b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.

   c. Moisture content as determined by Contractor for effective compaction without softening soil of trench bottom, foundation or trench walls.

2. Class II Embedment and Cement Stabilized Sand.

   a. Maximum 6-inches compacted thickness.

   b. Compaction by methods determined by Contractor to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.

c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.

L. For Storm Sewers constructed of any flexible pipe product and installed under pavement provide flowable fill pipe embedment as specified in Section 02322 - Flowable Fill.

M. Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.09 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.

B. For water lines, under pavement and to within one foot back of curb, use backfill materials described below:

1. For water lines 20-inches in diameter and smaller, use bank run sand or select backfill materials up to pavement base or subgrade.

2. For water lines 24-inches in diameter and larger, backfill with suitable on-site material (random backfill) up to 12-inches below pavement base or subgrade. Place minimum of 12-inches of select backfill below pavement base or subgrade.

C. For sewer pipes (Storm and Sanitary), use backfill materials described by trench limits. For "trench zone backfill" under pavement and to within one foot back of curb, use cement stabilized sand for pipes of nominal sizes 36-inches in diameter and smaller to level 12 inches below the pavement. For sewer pipes 42-inches in diameter and larger, under pavement or natural ground, backfill from 12-inches above top of pipe to 120 inches below pavement with suitable on-site material or select backfill. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12-inch backfill directly under pavement. For backfill materials reference Section 02320 - Utility Backfill Materials. This provision does not apply where a Storm Sewer is constructed of any flexible pipe product.

D. For Storm Sewers constructed of any flexible pipe product and installed under pavement provide flowable fill as specified in Section 02322 - Flowable Fill. For Storm Sewers constructed of any flexible pipe product and not installed under pavement provide cement stabilized sand.

E. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave sheeting in place. Cut off sheeting 1.5-feet or more above crown of pipe. Remove trench supports within 5-feet from ground surface.

F. Unless otherwise shown on Drawings. Use one of the following trench zone backfills under pavement and to within one foot of edge of pavement. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift.

1. Class I, II, or III or combination thereof:

a. Place in maximum 12-inch thick loose layers.

b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 698.

c. Moisture content within zero percent to 5 percent above optimum determined according to ASTM D 698, unless otherwise approved by Project Manager.

2. Cement-Stabilized Sand:

a. Maximum lift thickness determined by Contractor to achieve uniform placement and required compaction, but do not exceed 12-inches.

b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 558.

c. Moisture content on dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.

3. Class IVA and IVB (Clay Soils):

a. Place in maximum 8-inch thick loose lifts.

b. Compaction by vibratory Sheepfoot roller to minimum of 95 percent of maximum dry density determined according to ASTM D 698.

c. Moisture content within zero percent to 5 percent above optimum determined according to ASTM D 698, unless approved by Project Manager.

G. Unless otherwise shown on Drawings, for trench excavations not under pavement, random backfill of suitable material may be used in trench zone. This provision does not apply to flexible pipe used for storm sewers.

1. Fat clays (CH) may be used as trench zone backfill outside paved areas at Contractor's option. When required density is not achieved, at any additional cost to City, rework, dry out, use lime stabilization or other approved methods to achieve compaction requirements, or use different suitable material.

2. Maximum 9-inch compacted lift thickness for clayey soils and maximum 12-inch lift

thickness for granular soils.

3. Compact to minimum of 90 percent of maximum dry density determined according to ASTM D 698.

4. Moisture content as necessary to achieve density.

H. For electric conduits, remove form work used for construction of conduits

before placing trench zone backfill.

3.10 MANHOLES, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

A. Below paved areas or where shown on Drawings, encapsulate manhole with cement stabilized sand; minimum of 2 foot below base, minimum 2 foot around walls, up to pavement subgrade or natural ground. Compact in accordance with Paragraph 3.09.F.2 of this Section.

B. In unpaved areas, use select fill for backfill. Existing material that qualifies as select material may be used, unless indicated otherwise on Drawings. Deposit backfill in uniform layers and compact each layer as specified. Maintain backfill material at no less than 2 percent below nor more than 5 percent above optimum moisture content, unless otherwise approved by Project Manager. Place fill material in uniform 8-inch maximum loose layers. Compact fill to at least 95 percent of maximum Standard Proctor Density according to ASTM D 698.

C. For LDWL projects, encapsulate manhole with cement stabilized sand; minimum of 1 foot below base, minimum of 2 feet around walls, up to within 12-inches of pavement subgrade or natural ground. For manholes over water line, extend encapsulation to bottom of trench. Compact in accordance with Paragraph 3.09 F.2 of this Section.

3.11 FIELD QUALITY CONTROL

A. Test for material source qualifications as defined in Section 02320 - Utility Backfill Materials.

B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no additional cost to City.

C. Tests will be performed on minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity, or when requested by Project Manager.

D. At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement- stabilized sand in accordance with ASTM D 558. Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions.

1. For open cut construction projects and auger pits: Unless otherwise approved by Project Manager, successful compaction to be measured by

one test per 40 linear feet measured along pipe for compacted embedment and two tests per 40 linear feet measured along pipe for compacted trench zone backfill material. Length of auger pits to be measured to arrive at 40 linear feet.

2. A minimum of three density tests for each full shift of Work.

3. Density tests will be distributed among placement areas. Placement areas are: foundation, outer bedding, haunching, initial backfill and trench zone.

4. The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.

5. Density tests may be performed at various depths below fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.

6. Two verification tests will be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.

7. Recompacted placement will be retested at same frequency as first test series, including verification tests.

8. Identify elevation of test with respect to natural ground or pavement.

F. Recondition, re-compact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.

G. Acceptability of crushed rock compaction will be determined by inspection.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess materials in accordance with requirements of Section 01576 - Waste Material Disposal.

END OF SECTION 33 05 28

SECTION 33 11 00
WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Buried pipe and fitting.

B. Valves.

C. Fire hydrants.

D. Thrust blocks and harnessing.

E. Field quality control.

F. Test.

G. System disinfection.

H. Connections to existing mains.

1.2 RELATED SECTIONS

A. Trenching, bedding, and backfilling for pipelines are specified in Section 33 05 28 - Trenching and Backfilling for Utilities.

B. Coordinate the work of this Section with the work of Section 22 11 01 - Water Distribution

1.3 MEASUREMENT AND PAYMENT

A. General: Measurement and payment for the water distribution system will be either by the lump- sum method or by the unit-price method as determined by the listing of the bid item for the water distribution system indicated in the Bid Schedule of the Bid Form.

B. Lump sum: If the Bid Schedule indicates a lump sum for the water distribution system, the lump- sum method of measurement and payment will be in accordance with Section 01 20 00 Price and Payment Procedures, Article 1.03.

C. Unit price: If the Bid Schedule indicates a unit price for the water distribution system, the unit- price method of measurement and payment will be as follows:

1. Measurement:

a. Water distribution system will be measured for payment by the linear foot of pipe, installed in place, tested and disinfected, for each type and size of pipe, along the centerline of the pipe with deductions made for manholes or other

structures, measured from the inside face ofeach structure.

b. Utility structures will be measured separately for payment as specified in Section 33 05 16, Utility Structures.

c. Pipe fittings, valves, joints, pipe bedding, collar taps, and cutting of pipe will not be measured separately for payment, and all costs in connection therewith will be considered as included in the linear foot measurement for pipe.

d. Fire hydrants will be measured for payment by the individual unit (each), installed in place and acceptably tested.

e. Support of trench excavation, maintenance, support of existing utility facilities, grading, excavation and backfill, cast-in-place concrete, and incidental work pertaining to the installation of pipe will not be measured separately for payment, but will be considered as included in the linear foot measurement for pipe.

2. Payment: The water distribution system will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	ASTM A126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
2.	ASTM A197	Specification for Cupola Malleable Iron
3.	ASTM A307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
4.	ASTM D1784	Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
5.	ASTM D1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
6.	ASTM D2466	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
7.	ASTM D2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
8.	ASTM D2855	Practice for Making Solvent-Cemented Joints, with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

9. ASTM D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

10. ASTM F439 Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80

11. ASTM F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. American Water Works Association (AWWA):

1. AWWA C500 Gate Valve, 3 through 48 inches NPS – for Water and Sewage System

2. AWWA C503 Standard for Wet-Barrel Fire Hydrants
3. AWWA C504 Rubber Seated Butterfly Valve

4. AWWA C508 Swing-Check Valves for Water Works Service, 2 inches through 24 inches NPS

5. AWWA C606 Grooved and Shouldered Type Joints

6. ANSI/AWWA Standard for Disinfecting Water Mains C651

7. ANSI/AWWA Specification for Polyvinyl Chloride (PVC) Pressure Pipe, C900 4 in. through 12 in. for Water Distribution

C. Water Utility District Standards: Note that all work shall be performed and completed in accordance with the jurisdictional water utility district's standard drawings and specifications. The Contractor shall be responsible for obtaining all such standards and for compliance with such standards as applicable.

D. Underwriters Laboratories Inc. (UL):

1. UL 246 Hydrant for Fire-Protection Service

1.5 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Submit respective manufacturer's product data for manufactured materials and equipment, including all valves and fire hydrants.

C. Submit Shop Drawings showing piping layout and pipe, valves, hydrants, and locations of tie- ins, buttresses, and thrust blocks.

1.6 SUBMITTALS FOR CLOSEOUT

A. General: Refer to Section 01 77 00 - Closeout Procedures, and Section 01 78 23 -

Operation and Maintenance Data, for submittal requirements and procedures.

B. Record Drawings: Record actual location of piping mains, valves, connections, and invert elevations for review.

1.7 SITE CONDITIONS

A. Excavations in which products will be buried shall be dry.

B. Coordinate the installation of the water supply system with the jurisdictional water utility owner.

C. The jurisdictional water utility district shall provide water services to the water meters' points of connection for station facilities and landscape irrigation systems, and modifications to existing water mains, as indicated on the Contract Drawings. The Contractor shall be responsible for making all such arrangements.

PART 2 – PRODUCTS

2.1 BURIED PIPE AND FITTINGS

A. Requirements: Provide the types, sizes, and configurations of pipe, fittings, and miscellaneous materials and installation accessories as indicated.

B. PVC Pipe and Fittings, 3 Inches and Smaller:

1. Pipe: Polyvinyl chloride (PVC), ASTM D1785, Schedule 40 or 80, as indicated, Type I, Grade 1.

2. Fittings: ASTM D2466, socket weld, same material and schedule as pipe, or meeting requirements of ASTM F439, as applicable.

3. Joints: Socket welded with PVC solvent cement conforming to ASTM D2564 and ASTM D2855.

C. PVC Pipe and Fittings, 4 Inches and Larger:

1. Pipe: AWWA C900, Class 200, polyvinyl chloride (PVC) water pipe with bell and spigot ends and flexible ring joints.

2. Fittings: ASTM D1784, Type 1, Grade 1, polyvinyl chloride (PVC) fittings, Class 200, or meeting requirements of ASTM F439, as applicable.

3. Joints: ASTM D3139, gasketed bell joints with ASTM F477 gaskets.

2.2 VALVES

A. Gate Valves:

1. Gate Valves up to 2-1/2 Inches: 150-pound bronze body, non-rising stem,

single wedge, threaded connection.

2. Gate Valve 3 Inches and Over: AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, mechanical joint ends with type gland and serration's designed for plastic pipe service.

B. Pressure Reducing Valves: All bronze construction, spring-loaded, single-seated, suitable for tight shutoff under dead-end conditions. Provide with renewable composition seat discs, nylon inserted diaphragm, bolted spring chamber, and threaded connection.

C. Backflow Preventer: Provide a device that is approved by the jurisdictional water utility company. As a minimum, the backflow preventer shall be a reduced pressure principle assembly with two rising- stem gate shut-off valves, two resilient seat ball-valve test cocks, two check valves replaceable resilient disks and seat with relief valve with replaceable seat. Backflow preventer shall be suitable for 175 psig operating pressure and 140 degrees F operating temperature, and shall be of bronze construction with bronze internal parts and stainless steel springs, screwed inlet and outlet for 2-inch and smaller sizes, and cast iron, epoxy- coated construction with 150 pound flanged inlet and outlet for 3-inch and larger sizes.

2.3 FIRE HYDRANTS

A. Provide fire hydrants and related appurtenances as indicated. Fire hydrants shall comply with the requirements of the jurisdictional authority and the standard drawings and specifications of the jurisdictional water utility district, as applicable.

B. Fire hydrants shall meet the requirements of AWWA C502 and UL 246, as applicable, and shall be wet barrel type, as a minimum, with a minimum of two discharge nozzles of size(s) required by the jurisdictional authority.

2.4 CONCRETE FOR THRUST BLOCKS

A. Provide Class 3000, 1-inch aggregate, concrete for all thrust blocks, as specified in Section 03 05 15 - Portland Cement Concrete, with reinforcement where indicated.

2.5 MISCELLANEOUS METAL

A. Tie Rods: Stainless steel, Type 316, threaded ANSI standard, bolt threaded on both ends. Minimum 1/2-inch diameter for 4-inch pipe, 5/8-inch minimum diameter for 6-inch and 8-inch diameter pipe, and 3/4-inch minimum diameter for 12-inch and larger.

B. Rod Couplings: Malleable iron, ASTM A197, turnbuckle design, female threaded to mate with tie rods, 5/8-inch and 3/4-inch sizes to mate with both rods and mechanical joint bolts.

C. Pipe Clamps: For sizes 4 inches and larger, provide with malleable iron rod sockets. Provide washers in lieu of rod sockets where authorized, conforming with ASTM A126, Class A, cast iron. Bolts and bolting shall conform with ASTM A307.

PART 3 - EXECUTION

3.1 MAINTAINING WATER SERVICES

A. Maintain water service and conduct operations at times selected to minimize the duration and inconvenience of service interruption.

B. At least 24 hours prior to the required cutting or abandoning of an existing water main, notify the jurisdictional water utility owner, and obtain approval of the schedule. Actual cutting or abandoning of an existing water main shall be performed by the Contractor after receiving approval from the owner of the facility.

C. Keep existing water mains parallel to new water mains in service until new water mains are ready for service.

D. Where the existing water main or service is to be cut for connection to new piping, the work shall be performed by the Contractor. Initial work operations shall include the test-pitting of all points of connection (tie-in) to ensure the true location of existing linework.

E. Water valves in service shall be operated only by personnel of the jurisdictional water utility owner.

F. Except as specified otherwise herein, construction methods shall be in accordance with the applicable provisions of the jurisdictional water utility owner's standard drawings and specifications.

3.2 INSTALLATION

A. Installation Requirements:

1. Excavate pipe trench in accordance with Section 33 05 28 - Trenching and Backfilling for Utilities. Hand trim bottom of trench to approximately 6 inches below invert of pipe.

2. Top of pipe to finished grade shall be 30 inches unless otherwise indicated or approved by the Engineer.

3. Place sand bedding material, meeting the requirements of Section 33 05 28 - Trenching and Backfilling for Utilities, at trench bottom, level in one continuous layer not exceeding 8 inches in compacted depth. Compact bedding to 95 percent relative density.

4. Backfill around sides and to 6 inches above pipe with cover fill tamped in place and compacted to 95 percent relative density.

5. Test pipe distribution system and place tracer wire on top of pipe as specified herein prior to covering pipe. Backfill trench in accordance with Section 33 05 28 - Trenching and Backfilling for Utilities.

6. Maintain optimum moisture content of bedding material to attain required compaction density.

7. Provide concrete thrust blocks for elbows, tees, valves, and appurtenances of buried piping. Thrust blocks shall be constructed as indicated and in accordance with AWWA requirements.

8. Install piping true to line and grade, supported and guided to assure alignment under all conditions.

9. Install pipe to allow for expansion and contraction without stressing pipe or joints.

10. Install unions at each connection to valves, both sides of each valve.

11. Make change in line with fittings. Do not spring joints to effect change of direction.

12. Do not field cut pipe unless necessary. Make such necessary cuts by means of equipment designed for the purpose, ensuring a smooth and square end.

13. For connection to existing pipe, provide pipe with suitable ends or adapters, after verification of size and type of existing pipe.

14. Install tie rods and pipe clamps at every joint fitting and valve.

B. Valves:

1. Install valves in accordance with the valve manufacturer's installation instructions.

2. Where valves are provided by the jurisdictional water utility owner, provide suitable access for performance of such work.

3. Where necessary, alter the typical valve manhole to suit actual conditions. Any alterations in valve manholes shall be operable from the street level. All operator nuts shall be plumb to the valve manholes.

4. Set valve on solid bearing.

5. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Fire Hydrants:

1. Provide fire hydrant installations as indicated. Installation shall conform with requirements of the jurisdictional fire department and the water utility owner's standard drawings and specifications.

2. Provide necessary appurtenances and accessories as required to complete the installation.

3. Paint hydrants in accordance with applicable requirements of Section 09 91 00, Painting.

4. Set hydrants plumb, locate pumper nozzle perpendicular to and facing roadway.

D. Thrust Blocks and Harnessing:

1. Provide for counteracting thrust caused by static and dynamic forces, including water hammer at bends, tees, reducers, valves, and dead ends by installing harnessing as indicated or required. For other methods, submit details for approval of the jurisdictional water utility owner prior to use.

2. Provide concrete thrust blocks as indicated where harnessing is not practicable.

E. Water Service Connections: Provide water service connections, where necessary, in accordance with the California Plumbing Code, the installation instructions of the service pipe and fittings manufacturer, and the utility company requirements with reduced pressure back-flow preventer and water meter with by-pass valves.

F. Acceptance Requirements: After installation of pipes, ends of pipes shall be either capped or plugged. No piping shall be buried before being inspected and tested.

3.3 FIELD QUALITY CONTROL

A. Refer to Section 01 43 00 - Quality Assurance, for requirements.

B. Compaction testing of related earthwork shall be performed in accordance with applicable requirements of Section 31 00 00 - Earthwork.

C. If tests indicate work does not meet specified requirements, remove such work, replace, and retest at no additional cost to the District.

3.4 TESTS

A. Protection from Flooding: Provide positive measures to protect exposed, installed pipe and compacted pipe bedding from flooding during testing.

B. Notice of Testing:

1. Give 48 hours' notice of intention of testing to the jurisdictional water utility owner, which will furnish, install, and operate pumps, gages, meters, and individual pipe connections to test openings.
2. Designate largest sections feasible for testing and sterilizing. Testing and sterilizing operations shall be performed by the Contractor, at Contractor's expense.

C. Testing Requirements:

1. General:

a. Prior to backfilling, isolate the system by use of approved valves, caps and plugs, or other acceptable methods.

b. Maintain such isolation throughout the performance of leakage and pressure testing.

c. Where valves are used for isolation, eliminate leakage through such valves if it occurs. Maintain new work isolated from existing water mains, except for test connections, until testing and sterilization have been completed.

2. Hydrostatic Tests:

a. For hydrostatic tests, provide approved caps and plugs in sections to be tested, and remove them after testing.

b. Prevent leakage in pipes and fittings at openings. Temporarily block plugged and capped ends to prevent displacement.

c. Install the water source connection for testing the isolated section. The Engineer may permit the use of a tap that will be furnished and installed by utility owner.

d. Provide labor and materials required for leakage testing, including excavation for installation and removal of pumps, gages, meters, and water source connections.

e. Where leakage exceeds the water utility company's standards, perform necessary corrective measures.

f. Remove and replace defective pipes, joints, fittings, valves, and other appurtenances. Reset such items if displaced.

g. Perform hydrostatic tests in accordance with the jurisdictional water utility district's requirements. All such tests shall be witnessed by the jurisdictional water utility district's representative. The Contractor shall be responsible for making all such arrangements.

h. Remove and replace defective pipe, joints, fittings, valves, and other appurtenances. Reset such items if displaced.

D. Testing and Flushing of Potable Water System: Test the potable water system hydrostatically in sections to a pressure of at least 150 psi for not less than 15 minutes, witnessed by the Engineer. Pressure test pipe before burial. Repair leaks and retest the system until the system is leak free. Use testing instruments calibrated by a qualified laboratory in accordance with Section 01 45 00-
Quality Control. Test sequence shall be as follows:

1. Lines shall be fully flushed.

2. Lines shall be hydrostatically tested.

3. Lines shall be fully flushed.

4. Lines shall be fully disinfected.

3.5 SYSTEM DISINFECTION

A. Before final acceptance of the water supply system, each section of the new line shall be disinfected in accordance with ANSI/AWWA C651. One of the following sources of disinfectant shall be used:

1. Mixture of water and chlorine gas.

2. Direct application of chlorine.

3. Mixture of water and calcium hypochlorite; or

4. Mixture of water and calcium chloride.

B. Before disinfecting, flush the line thoroughly to remove dirt and extraneous materials. Clean each section of the line between valves independently.

C. Retain the disinfectant solution in the pipe for at least 24 hours. Following this sterilization period, the residual chlorine content at the ends of the section and at other representative points shall be not less than five parts per million. Then, the line shall be drained and thoroughly flushed with water until the residual chlorine content is similar to that obtained from the existing water distribution system.

D. Take water samples and test in accordance with ANSI/AWWA C651.

3.6 CONNECTIONS TO EXISTING MAINS

A. Following testing and sterilization, new water distribution lines shall be connected to existing mains as indicated. Each connection shall be made at a time and in a manner that will result in the least interruption of service.

B. All connections involving shut down of jurisdictional water utility's existing facilities shall be made under the immediate supervision of the jurisdictional water utility district. No member of the Contractor's forces may operate any valve controlling the flow of water in the water utility's existing system.

C. The Contractor shall provide tie-ins to the existing system at a time that is convenient to jurisdictional water utility district, which may be in the evenings and on weekends.

END OF SECTION 33 11 00

SECTION 33 31 00
SANITARY UTILITY SEWERAGE PIPING

PART 1 – GENERAL

SECTION INCLUDES

A. Buried Pipe and Fittings

B. Cleanouts

C. Sewage Ejector

D. Field Quality Control

1.01 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

B. Section 01 33 23 - Shop Drawings, Product Data, and Samples

C. Section 01 45 00 – Quality Control

D. Section 01 77 00 – Closeout Procedures

E. Section 01 78 23 – Operation and Maintenance Data

F. Section 01 78 39 – Project Record Documents

G. Section 22 13 01 – Sanitary Sewerage

H. Section 22 14 29 – Water Distribution

I. Section 31 00 00 – Earthwork

J. Section 33 05 16 – Utility Structures

K. Section 33 05 28 – Trenching and Backfilling for Utilities

1.02 MEASUREMENT AND PAYMENT

A. General: Measurement and payment for the site sanitary sewerage system will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for the site sanitary sewerage system indicated in the Bid Schedule of the Bid Form.

B. Lump Sum: If the Bid Schedule indicates a lump sum for the site sanitary sewerage system, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, under Article entitled “Lump-Sum Measurement”.

C. Unit Price: If the Bid Schedule indicates a unit price for the site sanitary sewerage system, the unit-price method of measurement and payment will be as follows:

1. Measurement:

a. Site sanitary sewerage system will be measured for payment by the linear foot of pipe, installed in place and tested, for each type and size, along the centerline of the pipe, with deductions made for manholes or other structures, measured from the inside face of each structure.

b. Utility structures will be measured separately for payment as specified in Section 33 05 16 - Utility Structures.

c. Pipe fittings, joints, pipe bedding, cleanouts, collar taps, and cutting of pipe will not be measured separately for payment, and all costs in connection therewith will be considered as included in the linear foot measurement for pipe.

d. Support of trench excavation, maintenance, support of existing utility facilities, excavation and backfill, concrete, and incidental work pertaining to the installation of sewer pipe will not be measured separately for payment, but will be considered as included in the linear foot measurement for sewer pipe.

2. Payment: Site sanitary sewerage system will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A21.11 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings

B. American Society for Testing and Materials (ASTM):

1. ASTM A74 Specification for Cast Iron Soil Pipe and Fittings

2. ASTM C12 Practice for Installing Vitrified Clay Pipe Lines

3. ASTM C14 Specification for Concrete Sewer, Storm Drain, and Culvert Pipe

4. ASTM C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

5. ASTM C425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings

6. ASTM C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets

7. ASTM C564 Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings

8. ASTM C700 Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated

9. ASTM D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

10. ASTM C2321 Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

11. ASTM D2466 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings, Schedule 40

12. ASTM D2564 Specification for Solvent Cements for Poly (Vinyl Chloride (PVC) plastic Pipe and Fittings

13. ASTM D2565 Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, Vent Pipe, and Fittings

14. ASTM D2729 Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

15. ASTM D2855 Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

16. ASTM D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

17. ASTM F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

C. American Water Works Association (AWWA):

1. ANSI/ Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch AWWA C900 through 12 inches for Water Distribution

D. Sanitary Utility District Standards: Note that all work shall be performed and completed in accordance with the jurisdictional sanitary utility district's standard drawings and specifications.
The Contractor shall be responsible for obtaining all such standards and for compliance with such standards as applicable.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Submit Shop Drawings showing piping layouts, sizes, types, cleanouts, and the sewage structure ejector station.

C. Submit the respective manufacturers' product data for manufactured materials and equipment.

D. Submit equipment manufacturer's printed operating and maintenance instructions in accordance with Section 01 78 23 - Operation and Maintenance Data, consisting of a detailed parts list, a recommended spare parts list, and complete operation and maintenance procedures.

E. Submit certified test reports of equipment, as applicable.

1.05 SUBMITTALS FOR CLOSEOUT

A. Refer to Section 01 77 00 - Closeout Procedures, and Section 01 78 39 - Project Record Documents, for submittal requirements and procedures.

B. Record actual location of piping mains, valves, connections, thrust restraints, and invert elevations.

1.06 SITE CONDITIONS

A. Excavations shall be dry immediately before and after products are installed. Provide surfaces and structures to, and on which sewerage products will be installed.

B. Coordinate the installation of the sanitary sewerage system with the jurisdictional sanitary district or utility owner.

PART 2 - PRODUCTS

2.01 BURIED PIPE AND FITTINGS

A. Requirements: Provide the types, sizes, and configurations of pipe, fittings, and miscellaneous materials and installation accessories as indicated and required. Pipe ends shall be bell and spigot, except plain end pipe shall be joined with mechanical clamp and gasket joint.

B. PVC Pipe and Fittings, 3 Inches and Smaller:

1. Pipe: Polyvinyl chloride (PVC), conforming with ASTM D1785, Schedule 40 or 80, as indicated, Type I, Grade 1, bell and spigot style solvent sealed jointed.

2. Fittings: ASTM D2466, Socket Weld, same material and schedule as pipe.

3. Joints: Socket welded with PVC solvent cement conforming with

ASTM D2564 and ASTM D2855.

C. PVC Pipe and Fittings, 4 Inches and Larger:

1. Pipe: AWWA C900, Class 200, Poly (Vinyl Chloride) (PVC) Water Pipe with Bell and Spigot Ends and Flexible Ring Joints.

2. Fittings: ASTM D2466, Type 1, Grade 1, Poly (Vinyl Chloride) (PVC) Fittings, Class 200.

3. Joints: ASTM D3139 gasketed bell joints with ASTM F477 gaskets.

D. Cast Iron Soil Pipe:

1. Pipe: ASTM A74.

2. Joint Devices: ASTM C564 or ANSI A21.11, rubber gasket joint devices, as applicable.

E. Clay Pipe:

1. Pipe: ASTM C700, unperforated.
2. Joint Device: ASTM C425, compression joint.

F. Concrete Pipe:

1. ASTM C14, Class 3, unreinforced.

2. Joint Device: ASTM C443, rubber compression gasket joint.

G. Reinforced Concrete Pipe:

1. Pipe: ASTM C76, Class III, with steel reinforcement.
2. Joint Device: ASTM C443, rubber compression gasket joint

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H. Pipe Accessories:

1. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, with neoprene ribbed gasket for positive seal.

2. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers traps, and other configurations as indicated or required.

I. Pipe Bedding Material: Clean sand as specified in Section 33 05 28 - Trenching and Backfilling for Utilities.

2.02 CLEANOUTS

A. At grade cleanouts shall have an adjustable sleeve-type housing, a threaded brass plug with countersunk slot, and cast-iron frame and cover.

2.03 SEWAGE EJECTOR

A. Provide in accordance with applicable requirements of Section 22 14 29 - Sump Pumps.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trench cut excavation base is ready to receive work and that excavations, dimensions, and elevations are as indicated.

3.02 PREPARATION

A. Excavations shall be free of water and extraneous material immediately before sanitary sewerage products are installed or placed. Bottoms of trenches shall have a 6-inch sand bed and shall be formed to support the bottom quadrant of the pipe and fittings. Should rock be encountered or should bedding material be unsuitable to support the products at design elevation, continue excavation to an elevation 8 inches below the design elevation and backfill with clean sand.

B. Hand trim excavations to required elevation.

C. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling and compacting operations.

D. Interior of pipe, pipe fittings, valves, drains, and cleanouts shall be cleaned of foreign substances before installation.

3.03 INSTALLATION REQUIREMENTS

A. Excavate pipe trench in accordance with Section 33 05 28 - Trenching and Backfilling for Utilities. Hand-trim bottom of trench to approximately 6 inches below invert of pipe.
B. Top of pipe to finished grade shall be 30 inches unless otherwise indicated or approved by the Engineer.

C. Place sand bedding material meeting the requirements of Section 33 05 28 - Trenching and Backfilling for Utilities, at trench bottom, level in one continuous layer not exceeding 8 inches in compacted depth. Compact bedding to 95 percent relative density.

D. Backfill around sides and to 6 inches above pipe with cover fill tamped in place and compacted to 95 percent relative density.

E. Test pipe distribution system and place tracer wire on top of pipe as specified herein prior to covering pipe. Backfill trench in accordance with Section 33 05 28 - Trenching and Backfilling for Utilities.

F. Maintain optimum moisture content of bedding material to attain required compaction density.

G. Install products where indicated. Remove and reinstall products that are disturbed after installation. Ends of products to which future connections will be made shall be either valved, or properly plugged, capped, and anchored.

H. Connections to existing facilities shall be made with fittings and short bends to suit the actual conditions. Connect products in accordance with the product manufacturer's installation instructions.

I. Pipe and fittings shall be set to line and grade before joints are made up. Angular deflections of joints shall not exceed the recommendations of the pipe and fitting manufacturer. Should the alignment require deflection of joints to be in excess of those recommended, use special bends to achieve the indicated deflection. Pipe ends and joints shall be prepared in accordance with the manufacturer's recommendations. As a minimum, pipe ends shall be sanded and cleaned, fittings shall be cleaned, and solvent shall be applied to both pipe and fittings.

J. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, and the manufacturer’s instructions. Seal joints water tight.

K. Lay pipe to slope gradients as indicated.

L. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches, compacted to 95 percent relative density.

3.04 INSTALLING PIPE

A. Protect pipe and fittings during handling to prevent damage.

B. Place, shape, and compact bedding material to receive barrel of pipe.

C. Start laying pipe at the lowest point; lay true to line and grade indicated.

D. Install pipe to bear on bedding material along its entire length.

E. Do not place the pipe on blocking material of any type.

F. Do not use wedges while installing the pipe.

G. Install pipe so that bells and grooves are on the upstream end.

H. Align each section of pipe with adjoining section leaving a uniform annular space between the bell and spigot to prevent sudden offsets in flow line.

I. As each section of pipe is laid, place sufficient bedding and backfill to hold it firmly in place.

J. Apply lubricant to rubber gasket (O-rings) immediately before joining pipe sections.

K. Keep interior of sewer clean as work progresses. Where small pipe sizes make cleaning difficult, keep a suitable swab and pulling line in the pipe, and pull through each joint immediately after jointing is completed.

L. Keep trenches and excavations dry and free of water during construction and until backfilling and compaction are completed.

M. When work is not in progress, securely plug ends of pipe and fittings to prevent extraneous matter from entering pipes and fittings.

N. Cut pipe ends, which project into a sewer structure, flush with the inside face of the structure and cover exposed pipe reinforcement with grout.

O. Where length of stub is not indicated, install a 4-foot length, and seal the free end with brick masonry bulkhead or an approved stopper.

P. Obtain the Engineer's approval before covering pipe.

Q. Where indicated, place additional bedding material around and over the pipe in lifts not exceeding 6 inches before compaction. Compact each lift before placement of the next lift.

R. Accomplish compaction by methods that will avoid damage to pipe and will not disturb its alignment and grade. The use of vibratory rollers is prohibited until compacted cover over pipe has reached 3 feet or half the pipe diameter; whichever is greater.

S. Connect sanitary sewerage system to existing public sanitary sewers in accordance with requirements of the jurisdictional authority.

3.05 PIPE CLEANOUTS

A. Installation: Cleanouts shall be the same size as the pipe, with 4-inch diameter as a minimum. Cleanouts for drainage pipe shall consist of a longsweep 1/4 bend, or one or two 1/8 bends extended to the location indicated. Wall or accessible piping cleanouts shall be T-pattern, 90degree branch drainage fittings having screw plugs. Cleanouts shall be provided at the base of each riser and shall consist of a wye pattern fitting with a screw plug.

B. Form and place cast-in-place concrete pad with provision for sanitary sewer pipe ends.

C. Establish elevations and invert for inlets and outlets.

D. Mount cleanout surface hub level in grout to elevation indicated.

3.06 FIELD QUALITY CONTROL

A. Requirements:

1. Refer to Section 01 45 00 - Quality Control, for field inspection and testing requirements.

2. Where drainage piping is located below invert slabs, conduct a ball, shuttlecock, or mandrel test to ensure that the line is free of obstructions subsequent to the placing of pervious backfill material over the line and prior to the placement of the concrete invert slab.

3. Upon completion of the test and determination that the line is free of obstructions, plug, cap, or otherwise close the open end or ends of the installed piping to prevent the entrance of debris into the lines.

4. Immediately prior to final inspection of the work, remove debris from manholes, drain inlets, and floor scupper drains. In the presence of the jurisdictional sanitary utility owner's representative prove by one of the methods specified above that the piping is free of obstructions.

5. The Contractor shall be responsible for making all necessary arrangements with the jurisdictional sanitary utility owner for performing and witnessing the required tests.

6. Request inspection of exposed piping prior to placing backfill.

7. Compaction testing of related earthwork shall be performed in accordance with applicable requirements of Section 31 00 00 - Earthwork.

8. If tests indicate work does not meet requirements, remove such work, replace, and retest at no additional cost to the District.

B. Sanitary Pipeline Tests:

1. Perform air tests on all installed sanitary sewer pipes upon completion of backfill.

2. Hydrostatically test all installed sanitary sewer force mains.

3. Test all manholes for infiltration or exfiltration.

4. Test pipe sections by the exfiltration test.

5. Test sewer 24 inches or less in diameter with low pressure.

6. Sewers with a diameter greater than 24 inches may be tested by visual inspection.

C. Exfiltration Test:

1. Tightly plug end of pipe at downstream manhole.

2. Fill sewer, at either upstream manhole or standpipe, with water.

3. Allow water to stand for not less than eight hours, and until pipe has become saturated. Refill manhole or pipe to measuring mark and begin test.

4. Exfiltration will be determined as follows:

a. If standpipe has been filled, maintain a head of water not less than 2 feet nor more than 15 feet above highest point in the line being tested.

1) Exfiltration: that volume of water added to standpipe during a 20-hour period.

b. If upstream manhole has been filled, measure original water elevation and, after 20 hours, final water elevation. Convert difference in elevation to gallons. Head of water shall be not less than 2 feet above highest point in the line being tested or not less than 2 feet above existing groundwater table, whichever is greater.

1) Exfiltration: that volume of water calculated from the difference in elevations during a 20-hour period.

5. Allowable leakage:

a. Not more than 200 gallons per 24 hours per diameter inch per mile of sewer.

b. If leakage exceeds permissible loss, sewer section will not be accepted.

c. Do not conduct another exfiltration test until conditions of groundwater surrounding pipe return to a condition similar to those existing at beginning of test period.

D. Infiltration Test:

1. Tightly plug end of pipe at upstream manhole.

2. Install a 90-degree notch weir in downstream manhole.

3. Allow water to accumulate behind weir until overflow is constant.

4. Allowable leakage:

a. Not more than 200 gallons per 24 hours per diameter inch per mile of sewer.

b. If measured infiltration is more than the allowable rate, sewer section will not be accepted.

E. Low-Pressure Air Test:

1. Clean and set sections of pipe to be tested before starting air test.

2. Plug pipe outlets with pneumatic plugs capable of resisting internal testing pressures without requiring external bracing.

3. Immediately following pipe cleaning and wetting, slowly supply air to plugged pipe until internal air pressure reaches 4 psi. Allow at least two minutes for temperature to stabilize before proceeding, except slowly add air to maintain a 3.5 psig to 4 psig pressure. While temperature is stabilizing, spray plugs, pipes, and hoses with soap solution and eliminate air leaks.

4. After temperature has stabilized, measure time required for pressure to drop from 3.5 psig to 2.5 psig. If measured time exceeds allowable time, pipe will not be accepted.

5. Time, in seconds, for pressure to drop from 3.5 to 2.5 psig shall be not less than the following: time for intermediate lengths shall be interpolated:

Length of Pipe Diameter in Inches

Pipe (Ft)	**8**	**10**	**12**	**15**	**18**	**21**	**24**
25	18	28	40	62	89	121	158
50	35	55	79	126	178	243	317
75	53	83	119	186	267	364	475
100	70	110	158	248	356	485	634
125	83	38	198	309	444	595	680
150	100	165	238	375	510	595	680
175	123	193	277	425	510	595	680
200	141	120	317	425	510	595	680
225	158	248	340	425	510	595	680
250	176	275	340	425	510	595	680

F. Visual Test Method: Slowly pull a television camera through sewer and inspect for visual leaks and cracks in pipe. Repair leaks, then re-inspect pipe.

G. Joint Pressure Testing:

1. Insert sealing packer with joint testing capability, into sewer line.

2. Place sealing packer around joint and pressure test joint. If a drop in air pressure occurs, reseal the joint.

3. Repeat procedure for each joint.

H. Criteria for Acceptance: The section of sewer being tested will not be accepted if test results exceed allowable leakage or take less time than minimum holding time. If pipe proves to be unacceptable, immediately repair defective materials and installation. The Contractor will not be permitted to change to another test if original test method reveals system has failed.

I. Obstruction Tests:

1. Perform field tests to verify that installed sanitary systems are free from obstructions.

2. Remove obstructions by excavating at the apparent obstruction and repairing or replacing the defective pipe.

END OF SECTION 33 31 00

SECTION 33 41 00
STORM SEWAGE SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section specifies the requirements for providing storm sewers and appurtenant structures.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. AASHTO: American Association of State Highway and Transportation Officials

   a. M 36: Specification for Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.

   b. M 190: Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.

   c. M 252: Specification for Corrugated Polyethylene Drainage Tubing.

   d. M 294: Specification for Corrugated Polyethylene Pipe 12 inch to 36-inch diameter.

2. ASTM: American Society for Testing and Materials

   a. A 48: Specification for Gray Iron Castings.

   b. A 74: Specification for Cast Iron Soil Pipe and Fittings.

   c. C 40: Test Method for Organic Impurities in Fine Aggregate for Concrete.

   d. C 76: Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

   e. C 150: Specification for Portland Cement.

   f. C 443: Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.

   g. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

   h. D 618: Conditioning Plastics and Electrical Insulating Materials for Testing.

i. D 1248: Polyethylene Plastics Molding and Extrusion Material.

j. D 1693: Environmental Stress Cracking of Ethylene Plastics.

k. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

l. D 2239: Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on
Controlled Inside Diameter.

m. D 2412: Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

o. D 2447: Specifications for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

p. D 2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

q. D 2467: Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

r. D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

s. D 2665: Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.

t. D 2729: Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

u. D 2855: Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

v. D 3035: Specifications for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

w. D 3212: Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

x. D 3261: Specification for Butt Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

y. D 3350: Specification for Polyethylene Plastics Pipe and Fittings Material.

z. F 402: Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.

aa. F405: Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

bb. F 412: Standard Terminology Relating to Plastic Piping Systems.

cc. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

dd. F 656: Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Pipes and Fittings.

ee. F 714: Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ff. F 913: Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

gg. F 667: Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

3. Federal Specification

a. SS-S-210A and Latest Amendments: Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

4. Houston

a. Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage and Street Paving, September 1996 or latest revision.

1.3 SUBMITTALS

A. In accordance with Section 013300 – Submittal Procedures of these Specifications, the following shall be submitted:

1. Certificates

a. Manufacturer's certificates and load tickets stating that materials meet specified requirements.

2. Shop Drawings

a. Shop Drawings and details of all storm sewers and drains, including relationship to other systems and true position and details of all interfaces, connections, inlets, clean- outs, manholes, alignment and grade, changes of direction, offsets, bedding and protection, materials, manufacturer's installation and connection instructions and recommendations, and all other pertinent data.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products for use within Harris County right-of-way shall meet the applicable requirements.

2.2 PIPES AND FITTINGS

A. Reinforced Concrete Pipe (RCP)

1. ASTM C 76, bell-and-spigot, Class III, Wall B.

B. Corrugated Galvanized Metal Pipe (CGMP)

1. AASHTO M 36, coated and paved in accordance with AASHTO M 190, Type C coating for pipe and Type A coating for coupling bands.

C. PVC Pipe in accordance with the following:

1. ASTM D 1785.
2. ASTM D 2241.
3. ASTM D 2466.
4. ASTM D 2467.

D. PE Pipe

1. ASTM D 2447.
2. ASTM D 3035.
3. ASTM D 3350 Type PE 3408.
4. ASTM F 714 Type PE 3408.

2.3 JOINTS

A. Gaskets for RCP in accordance with the following:

1. Federal Specification SS-S-210A.
2. ASTM C 443.

B. All joints in PVC plastic pipe shall be solvent cemented in accordance with the following:

1. ASTM D 2564.

2. ASTM D 2672.

3. ASTM D 2855.

4. ASTM F 402.

5. ASTM F 656.

C. All joints in PE plastic pipe shall be fusion butt-welded in accordance with ASTM 3261.

2.4 DRAINAGE STRUCTURES

A. Manhole

Type as indicated on the Drawings and conforming to applicable Standards for Houston or HCFCD Right-of-Way, or WISD Property. Frame and Cover ASTM A 48 Class 35 B.

B. Inlet

Type as indicated on the Drawings and conforming to applicable Standards in Houston or HCFCD Right-of-Way, or WISD Property. Frame and Grate ASTM A 48 Class 35 B.

C. Reinforcing Steel

As specified in Section 032100 - Concrete Reinforcement of these Specifications.

D. Cast-in-Place Concrete (Class 3000)

As specified in Section 321373.19 - Cast-in-Place Concrete of these Specifications.

E. Mortar (Type M)

2.5 CEMENT-STABILIZED SAND BACKFILL

A. Aggregate

Use clean sand; deleterious materials in the sand shall not exceed the following limitations, by weight:

Material removed by denatation	5.0 percent
Clay lumps	0.5 percent
Other deleterious substances such as coal, shale, coated grains of soft flaky particles.	2.0 percent

Gradation Requirements:

Retained on 3/8-in. sieve	0 percent
Retained on 1/4-in. sieve	0 - 5 percent

Retained on 20-mesh sieve	15 - 50 percent
Retained on 100-mesh sieve	80 - 100 percent

Color test per ASTM C 40, color not darker than standard color.

B. Cement

ASTM C 150, Type I or II.

C. Water

Potable, from municipal supplies approved by the State or City Health Department.

D. Mixture

Use at least 1-1/2 sacks of cement per cubic yard of mixture. Use amount of water required to provide mix suitable for mechanical hand tamping and mix in approved mixer. Stamp load tickets at plant with time of loading. Material not in place within 1-1/2 hours after loading or that has obtained an initial set will be rejected and shall be removed from the Site and replaced with new acceptable mixtures at no additional cost to WISD.

2.6 TIMBER POSTS

A. Southern Pine or Douglas Fir, pressure-treated in accordance with American Wood Preservers' Association (AWPA) Standards.

PART 3 - EXECUTION

3.1 GENERAL

A. All storm sewer work performed within Houston right-of-way shall meet the applicable requirements.

3.2 EXCAVATION

A. All excavation shall be in accordance with Section 017330 - Trench Safety Systems of these Specifications.

B. Perform excavation for storm sewer and storm sewer drainage structures to line and grade required as shown on the Drawings and as specified herein.

C. If the excavation exceeds the permissible dimensions, extend the encasement or install pipe of higher strength, as directed.

D. Prevent surface or ground water from flowing into excavation. Install, operate, and maintain dewatering system to convey water away from excavation. Notify the Engineer in writing of delays to the Work caused by water intrusion.

3.3 PIPE ENCASEMENT

A. Place cement-stabilized sand bedding before laying pipe. Bedding shall be compacted and shaped to fully support the pipe.

B. After the pipe is laid, place cement-stabilized sand beside and above the pipe in 4 in. lifts to the limits shown on the construction drawings. Compact individual lifts with a hand-operated, motorized tamper; exercise care to avoid damaging the pipe.

3.4 LAYING PIPE

A. Install and joint pipe in accordance with the pipe manufacturer's instructions and as specified herein.

B. Provide a minimum of 6 in. clearance between storm sewer and sanitary sewer.

C. Seal open end of pipe with plug when pipe laying operation is temporarily halted. Plug shall remain in place until operation restarts.

3.5 BACKFILL

A. On completion of construction, backfill the excavation as specified in Section 312300 – Excavation, Grading, and Fill of these Specifications and in accordance with details on the construction drawings. Backfill only when the written approval of the Engineer is obtained to do so.

3.6 CONSTRUCTION OF MANHOLES AND INLETS

A. General

1. Construct manholes and inlets as soon as practical after sewer lines into or through the manhole or inlet locations are completed.

2. Construct manholes and inlets at locations and of the type indicated. All manholes within 9 feet of existing water lines shall be watertight.

B. Manholes

1. Provide base of the shape and size required with a minimum thickness of 12 inches.
2. Place axis of manholes directly over the centerlines of the lines, unless otherwise indicated.

3. Shall be constructed of either precast or cast-in-place concrete.

C. Inlets

1. Shall be constructed of either precast or cast-in-place concrete.

3.7 CLEANUP

A. Remove temporary structures, rubbish, waste materials, and excess excavated materials from the Site and dispose of legally.

END OF SECTION 33 41 00

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JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A PROJ. #: 23141

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

100% CONSTRUCTION DOCUMENTS ISSUE FOR BID/PERMIT

PROJECT TEAM:

ARCHITECT	BRAVE / ARCHITECTURE
CIVIL	DALLY + ASSOCIATES
LANDSCAPE	KW LANDSCAPE ARCHITECTS
STRUCTURAL	DALLY + ASSOCIATES
MEP	ASEI ENGINEERING
BUILDING ENVELOPE	PRICE CONSULTING, INC
AV/IT CONSULTANT	DATACOM DESIGN GROUP

AB	ANCHOR BOLT	JAN	JANITOR
ACOUS	ACOUSTICAL	JST	JOIST
AD	ACCES DOOR	JT	JOINT
ADA	AMERICAN WITH DISABILITIES ACT		
ADJUST.	ADJUSTABLE	LAM	LAMINATE (D)
ADJ	ADJACENT	LAV	LAVATORY
AFF	ABOVE FINISHED FLOOR	LGTH	LENGTH
AGG	AGGREGATE	LH	LEFT HAND
AHU	AIR HANDLING UNIT	LIN	LINEAR
ALT	ALTERNATE	LOKR	LOCKER(S)
ALUM	ALUMINUM	LL	LIVE LOAD
ANOD	ANODIZED	LT	LIGHT
APPROX	APPROXIMATELY	LWT	LIGHTWEIGHT
AP	ACCESS PANEL		
A-R	ABUSE RESISTANT	MACH	MACHINE
ARCH	ARCHITECT (URAL)	MAINT	MAINTENANCE
A-S	AS SHOWN	MAS	MASONRY
ASPH	ASPHALT	MATL	MATERIAL
ATN	ATTENUATION (ING)	MAX	MAXIMUM
AUTO	AUTOMATIC	MB	MACHINE BOLT
AUX	AUXILIARY	MECH	MECHANICAL
AVE	AVENUE	MEMB	MEMBRANE
AVG	AVERAGE	MEP	MECHANICAL, ELECTRICAL, PLUMBING
A/C	AIR CONDITIONING	MFR	MANUFACTURER
A/V	AUDIO VISUAL	MH	MANHOLE
		MIN	MINIMUM
BD	BOARD	MISC	MISCELLANEOUS
BLDG	BUILDING	ML	METAL LATH
BLKG	BLOCKING	MO	MASONRY OPENING
BLK	BLOCK	MR	MOISTURE RESISTANT
BM	BEAM	MTD	MOUNTED
BOT	BOTTOM	MTG	MOUNTING
BRG	BEARING	MTL	METAL
BRKT	BRACKET	MULL	MULLION
BSMT	BASEMENT		
BTW	BETWEEN	NIC	NOT IN CONTRACT
BUR	BUILT UP ROOFING	NOM	NOMINAL
B&B	BALLED & BURLAPPED	NO. OR #	NUMBER
B-B	BACK TO BACK	NRC	NOISE REDUCTION COEFFICIENT
B.M.	BENCH MARK	NTS	NOT TO SCALE
B/F	BOTH FACES		
		OA	OVERALL
CAB	CABINET	OC	ON CENTER (S)
CB	CHALK BOARD	OD	OUTSIDE DIAMETER
CCTV	CLOSED CIRCUIT TELEVISION	OFCI	OWNER FURNISHED / CONTRACTOR INSTALL
CEM	CEMENT		
CER	CERAMIC	OFF	OFFICE
CFMF	COLD FORMED METAL FRAMING		
CIP	CAST IN PLACE	OFOI	OWNER FURNISHED / OWNER INSTALLED
CI PIPE	CAST IRON PIPE		
CJ	CONTROL JOINT	OH	OVERHEAD
CKBD	CHALKBOARD	OPH	OPPOSITE HAND
CLG	CEILING	OPNG	OPENING
CLR	CLEAR (ANCE)	OPP	OPPOSITE
CLT	CLOSET	ORD	OVERFLOW ROOF DRAIN
CMU	CONCRETE MASONRY UNIT	O/A	OUTSIDE AIR
CNTR	COUNTER		
COL	COLUMN	PART	PARTITION
COMPRES	COMPRESSIBLE	PCF	POUNDS PER CUBIC FOOT
COMP	COMPOSITION	PCP	PORTLAND CEMENT PLASTER
CONC	CONCRETE	PERF	PERFORATED
COND	CONDITION	PLAM	PLASTIC LAMINATE
CONF	CONFERENCE	PLAST	PLASTER
CONST	CONSTRUCTION	PLAS	PLASTIC
CONTR	CONTRACTOR	PLBG	PLUMBING
CONT	CONTINUOUS	PLWD	PLYWOOD
CORRU	CORRUGATED	PNL	PANEL
CORR	CORRIDOR	POL	POLISHED
CSMT	CASEMENT	PRKG	PARKING
CTR	CENTER	PR	PAIR
CTSK	COUNTERSUNK	PSF	POUNDS PER SQUARE FOOT
CT	CERAMIC TILE	PSI	POUNDS PER SQUARE INCH
CU FT	CUBIC FOOT (FEET)	PTD	PAINTED
CU YD	CUBIC YARD	PVC	POLYVINYL CHLORIDE
C	CURB	PVG	PAVING
C-C	CENTER TO CENTER	PVMT	PAVEMENT
C.O.	CASED OPENING	P.L.	PROPERTY LINE
		P/C	PRECAST
DB	DRY MARKER BOARD		
DBL	DOUBLE	QT	QUARRY TILE
DEFL	DEFLECTION		
DF	DRINKING FOUNTAIN	R	RADIUS
DIAG	DIAGONAL	R/AG	RETURN AIR GRILLE
DIA	DIAMETER	R/A	RETURN AIR
DIM	DIMENSION	RCP	REFLECTED CEILING PLAN
DISC	DISCONNECT	RD	ROOF DRAIN
DISP	DISPENSER	REBAR	REINFORCING BAR
DL	DEAD LOAD	RECEPT	RECEPTION
DMPFG	DAMPROOFING	RECEP	RECEPTACLE
DN	DOWN	RECOM	RECOMMENDATION
DR	DOOR	REC	RECESSED
DS	DOWNSPOUT	REG	REGULATION
DTL	DETAIL	REINF	REINFORCED
DWC	DRYWALL FURRING CHANNEL	REQD	REQUIRED
DWG	DRAWING	RES	RESILIENT
D	DEPTH	RET	RETURN
		REV	REVISION
EA	EACH	RE:	REFER TO
EFOB	EXTERIOR FACE OF BUILDING	RFG	ROOFING
EIFS	EXTERIOR INSULATED FINISH SYSTEM	RH	RIGHT HAND
EJ	EXPANSION JOINT	RI	RISER
ELAS	ELASTIC (ELASTOMERIC)	RM	ROOM
ELEC	ELECTRICAL	ROW	RIGHT OF WAY
ELEV	ELEVATOR	R.T.U.	ROOF TOP UNIT
EL	ELEVATION		
EMER	EMERGENCY	SCHED	SCHEDULE
EP	EXPLOSION PROOF	SC	SOLID CORE
EQUIP	EQUIPMENT	SECT	SECTION
EQ	EQUAL	SF	SQUARE FEET
ESR	ELASTIC SHEET ROOFING	SHLV	SHELVES(ING)
EWC	ELECTRIC WATER COOLER	SHTHG	SHEATHING
EWH	ELECTRIC WATER HEATER	SHT	SHEET
EW	EACH WAY	SHWR	SHOWER(S)
EWSH	EYE WASH	SPEC	SPECIFICATION
EXH	EXHAUST	SQ	SQUARE
EXIST	EXISTING	SS	STAINLESS STEEL
EXPAN	EXPANSION	STAB	STABILIZE (D)
EXP	EXPOSED	STA	STATION
EXT	EXTERIOR	STC	SOUND TRANSMISSION COEFFICIENT
		STD	STANDARD
FA	FIRE ALARM	STL	STEEL
FC	FIRE CODE	STG	STORAGE
FD	FLOOR DRAIN	STR	STRUCTURE (AL)
FEC	FIRE EXTINGUISHER CABINET	SUSP	SUSPENDED
FHC	FIRE HOSE CABINET	SW	SWITCH
FH	FIRE HYDRANT	SYM	SYMMETRICAL
FIN	FINISH (ED)	SYN	SYNTHETIC
FIXT	FIXTURE	S/AD	SUPPLY AIR DIFFUSER
FLRG	FLOORING		
FLR	FLOOR	TA	TOILET ACCESSORY
FLSHG	FLASHING	T.A.S.	TEXAS ACCESSIBILITY STANDARDS
FLUOR	FLUORESCENT	T.B.	TACK BOARD
FL	FLOW LINE	TCOC	TEXTURED COATING ON CONCRETE
FM	FACTORY MUTUAL	T.O.	TOP OF
FR	FIRE RETARDANT	T.O.C.	TOP OF CURB
FRPF	FIREPROOF	TEL	TELEPHONE
FS	FULL SIZE	TEMP	TEMPERED
FTG	FOOTING	THK	THICK (NESS)
FT	FOOT (FEET)	THRES	THRESHOLD
FURN	FURNISH	TB	TACKBOARD
FURR	FURRED (ING)	TLT	TOILET (S)
F.V.	FIELD VERIFY	TRZO	TERRAZZO
FVC	FIRE VALVE CABINET	TR	TREAD
		TTC	TELEPHONE TERMINAL CABINET
GALV	GALVANIZED	TV	TELEVISION
GAL	GALLON	TYP	TYPICAL
GA	GAGE	T	TOP
GC	GENERAL CONTRACTOR		
GD	GRADE, GRADING	UL	UNDERWRITERS LABORATORY
GEN	GENERAL	UNO	UNLESS NOTED OTHERWISE
GI	GALVANIZED IRON	UR	URINAL
GL	GLASS, GLAZING		
GMMU	GLASS MESH MORTAR UNIT	VAC	VACUUM
GMP	GUARANTEED MAXIMUM PRICE	VCT	VINYL COMPOSITION TILE
GR	GROUND	VERT	VERTICAL
GYP	GYPSUM	VEST	VESTIBULE
		VIF	VERIFY IN FIELD
HB	HOSE BIBB	VWC	VINYL WALL COVERING
HC	HOLLOW CORE		
HDCP	HANDICAPPED	WC	WATER CLOSET
HDWD	HARDWOOD	WDW	WINDOW
HDWR	HARDWARE	WD	WOOD
HD	HEAD	WF	WIDE FLANGE
HFS	HALF FULL SIZE	WH	WALL HUNG
HM	HOLLOW METAL	WI	WROUGHT IRON
HORIZ	HORIZONTAL	WP	WATERPROOF (ING)
HP	HORSEPOWER		
HR	HOUR	WR	WATER RESISTANT
HT	HEIGHT	WT	WEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING	WWF	WELDED WIRE FABRIC
		WP	WORK POINT
HYD	HYDRANT	W/I	WITHIN
		W/O	WITHOUT
IBC	INTERNATIONAL BUILDING CODE	WP	WORK POINT
ID	INSIDE DIAMETER	W/	WITH
INCAND	INCANDESCENT	W/I	WITHIN
INCL	INCLUDE		
INFO	INFORMATION	XFMR	TRANSFORMER
INSUL	INSULATION (ING)		
INT	INTERIOR		
IN	INCH		
IPS	INSIDE PIPE SIZE		

ABBREVIATIONS 12" = 1'-0" | 1

GRASS

COMPACTED EARTH FILL (SECTION)

ROCK FILL (SECTION)

COMMON BRICK (PLAN AND SECTION)

TYPICAL CMU (PLAN AND SECTION)

CAST-IN-PLACE CONCRETE (SECTION)

TYPICAL STONE (SECTION)

MARBLE (PLAN AND SECTION)

TERRAZZO (SECTION)

CERAMIC TILE (SECTION)

STEEL (PLAN AND SECTION)

SOLID SURFACING (SECTION)

CEMENT BOARD (SECTION)

GYPSUM BOARD (SECTION)

PLASTER (PLAN AND SECTION)

METAL SOFFIT PANEL

PLYWOOD (SECTION)

FINISHED WOOD (PLAN, ELEV, AND SECTION)

BATT INSULATION (SECTION)

BATT INSULATION (SECTION)

ACOUSTICAL TILE (SECTION)

WOOD FRAMING - INTERRUPTED (BLOCKING, SHIM, ETC.)

WOOD FRAMING - CONTINUOUS (SECTION)

MATERIAL CONVENTIONS 15

FLOOR DUPLEX OUTLET - GROUNDED

FLOOR TELEPHONE OUTLET

FLOOR DATA OUTLET

FLOOR DATA / ELECTRICAL OUTLET

WP — WALL MOUNTED DUPLEX POWER OUTLET WITH WEATHERPROOF COVER - GROUNDED

WALL MOUNTED DUPLEX POWER OUTLET (GROUNDED)

GFI — WALL MOUNTED DUPLEX POWER OUTLET (GFI)

WALL MOUNTED QUADPLEX POWER OUTLET (GROUNDED)

PLUGMOLD - GROUNDED

WALL MOUNTED TELEPHONE OUTLET (GROUNDED)

WALL MOUNTED DATA / ELECTRICAL OUTLET

D — WALL MOUNTED DATA OUTLET

WALL MOUNTED COAX OUTLET

WALL MOUNTED LIGHT FIXTURE

J — ELECTRICAL J BOX

2X4 FLUORESCENT LIGHT FIXTURE.

2X2 FLUORESCENT LIGHT FIXTURE.

1X4 FLUORESCENT LIGHT FIXTURE.

FLUORESCENT STRIP LIGHT.

RECESSED "CAN" LIGHT FIXTURE. SEE MEP

RECESSED "CAN" ADJUSTABLE LIGHT FIXT-POINT TO DIRECTION OF ARROW.

PENDANT LIGHT FIXTURE.

BUILDING WALL LIGHT FIXTURE. SEE MEP

PENDANT HUNG MH LIGHT FIXTURE. SEE MEP

CEILING SPEAKER - RECESSED

WALL SCONCE LIGHT FIXTURE. SEE MEP

PENDANT LIGHT FIXTURE. DRAW TO SCALE. SEE MEP

SP — FIRE SPRINKLER HEAD. COORDINATE WITH SPRINKLER INSTALLER. ARCHITECT HAS FINAL APPROVAL OF HEAD LOCATIONS.

TRACK LIGHTING. DRAW TO SCALE. SHOW CORRECT NUMBER OF HEADS

WALL MOUNTED "HOLLYWOOD" LIGHTING

GROUND MOUNTED UP LIGHT(S)

$ — WALL SWITCH

$3 — WALL SWITCH (3-WAY)

$4 — WALL SWITCH (4-WAY)

$D — WALL SWITCH DIMMER

S.A.C. — RECESS MOUNTED SECURITY ACCESS CARD

S.K.P. — RECESS MOUNTED SECURITY KEY PAD

S.C.P. — RECESS MOUNTED SECURITY CONTROL PANEL

S — WALL MOUNTED SMOKE DETECTOR

WALL MOUNTED EMERGENCY LIGHT BATTERY POWERED

EXIT LIGHT CEILING MOUNTED; NON-DIRECTIONAL

EXIT LIGHT CEILING MOUNTED - DIRECTIONAL, POINT ARROW IN DIRECTION OF EGRESS

EXIT LIGHT WALL MOUNTED; NON-DIRECTIONAL

EXIT LIGHT WALL MOUNTED - DIRECTIONAL, POINT ARROW IN DIRECTION OF EGRESS

T — WALL MOUNTED THERMOSTAT

B — WALL MOUNTED BELL BUTTON

C — WALL MOUNTED BELL CHIME

WALL MOUNTED CLOCK

MECH. & ELEC. DRAWING SYMBOLS 13

PENDANT LIGHT ABOVE

CONTINUOUS SHELF OR UNDER COUNTER LIGHT FIXT, DRAW TO SCALE

2'x2' LAY-IN ACOUSTICAL TILE SUSPENDED CEILING SYSTEM

CEILING FAN

CEILING FAN ABOVE

WALL MOUNTED SUPPLY DIFFUSER. SEE MEP

WALL MOUNTED RETURN DIFFUSER. SEE MEP

HVAC SUPPLY AIR SLOT. SEE MEP

HVAC RETURN AIR SLOT. SEE MEP

HVAC SUPPLY GRILLE. SEE MEP

HVAC RETURN GRILLE. SEE MEP

HVAC RETURN/EXHAUST GRILL. SEE MEP

MECH. & ELEC. DRAWING SYMBOLS 12

NORTH SYMBOL

WORKING POINT: START WORK AT THIS LOCATION

+333.77 — EXISTING GRADE ELEVATION

+333.77 — NEW GRADE / SLAB ELEVATION

BOUNDARY OF WORK AREA

RE: XX/A.XXX / RE: XX/A.XXX — DRAWING MATCHLINE

REVISION NUMBER

REVISION CLOUD

6'-0" 4'-0" / 10'-0" / 10'-0" FV / 10'-0" — DIMENSIONS: All dimensions to face of stud unless otherwise noted

FIELD VERIFY: Indicate existing dim.- contractor to field verify.

DOTS: Indicate centerline of object or column lines

EXISTING PARTITION REMAINS

REMOVE PARTITION

NEW PARTITION

EXISTING DOOR REMAINS

REMOVE DOOR

PROVIDE DOOR

COL — EXISTING COLUMN LINE

COL — NEW COLUMN LINE

0'-0" A.F.F. / T.O. CONC. — FLOOR LINE (ELEVATION)

UPPER ROOM / 1111.1 / 000 S.F. / 0'-0"A.F.F. — ROOM DESIGNATION

110.1A — DOOR DESIGNATION

110.1A — WINDOW DESIGNATION

KEY NOTE DESIGNATION

A3 — PARTITION TYPE DESIGNATION

S.XXX — SIGNAGE DESIGNATION

CPT. — FINISH MATERIAL DESIGNATION

1 — ACCESSORY/EQUIPMENT DESIGNATION

[CS.01] — CASEWORK DESIGNATION

A.XXX / XX — PICTURE LOCATION DESIGNATION

XX/A.XXX — EXTERIOR ELEVATION DESIGNATION

XX/A.XXX — INTERIOR ELEVATION DESIGNATION

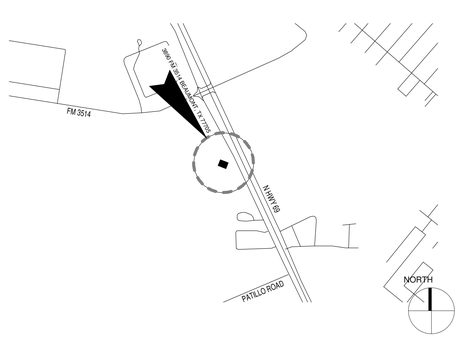
XX/A.XXX — DETAIL AND VERTICAL SECTIONS

XX / A.XXX — BUILDING / WALL SECTION

XX / A.XXX — BUILDING / WALL SECTION

XX/A.XXX — ENLARGED DETAIL

DRAWING SYMBOLS 9



SHEET INDEX 8

SHEET NUMBER	SHEET NAME
GENERAL INFORMATION	
G.001	INDEX & GENERAL INFO
G.010	CODE REVIEW
G.011	LIFE SAFETY SITE PLAN
G.012	LIFE SAFETY FLOOR PLAN
G.020	TEXAS ACCESSIBILITY GUIDELINES
G.030	SITE SURVEY
G.050	MASTER KEY NOTES & GENERAL NOTES
G.051	MASTER KEY NOTES
CIVIL	
C1.00	DEMOLITION PLAN
C2.00	LAYOUT PLAN
C3.00	PAVING PLAN
C4.00	UTILITY PLAN
C5.00	GRADING PLAN
C6.00	DRAINAGE AREA MAP
C7.00	SWPP
C8.00	SITE DETAIL SHEET 1 OF 2
C8.01	SITE DETAIL SHEET 2 OF 2
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L1.01	LANDSCAPE PLAN
L1.02	LANDSCAPE NOTES AND DETAILS
L2.01	IRRIGATION PLAN
L2.02	IRRIGATION NOTES AND DETAILS
DEMOLITION DRAWINGS	
D.010	DEMOLITION - SITE PLAN
D.011	DEMOLITION - SITE PHOTOS
D.101	DEMOLITION - OVERALL FLOOR PLAN
D.110	DEMOLITION - ENLARGED FLOOR PLAN POD 200
D.111	DEMOLITION - INTERIOR PHOTOS
D.121	DEMOLITION - OVERALL REFLECTED CEILING PLAN
D.125	DEMOLITION - ENLARGED REFLECTED CEILING POD 200
D.200	DEMOLITION - ROOF PLAN
D.300	DEMOLITION - EXTERIOR ELEVATION
SITE DRAWINGS	
A.010	SITE PLAN
A.030	ENLARGED SITE PLAN
A.040	SITE DETAILS
FLOOR PLANS	
A.100	OVERALL FLOOR PLAN
A.101	ENLARGED FLOOR PLAN - POD 200
A.102	ENLARGED FLOOR PLAN - POD 400
A.120	OVERALL REFLECTED CEILING PLAN
A.121	ENLARGED REFLECTED CEILING PLAN - POD 200
A.122	ENLARGED REFLECTED CEILING PLAN - POD 400
A.150	FINISH SCHEDULE
A.151	OVERALL FINISH PLAN
A.152	ENLARGED FINISH PLAN - POD 200
ROOF PLANS	
A.200	ROOF PLAN
A.201	ROOF DETAILS
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A.300	EXTERIOR ELEVATIONS
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A.402	BUILDING SECTIONS
WALL SECTIONS	
A.501	INTERIOR WALL SECTIONS
A.502	EXTERIOR WALL SECTIONS
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A.601	PLAN DETAILS
A.610	SECTION DETAILS
A.611	EXTERIOR GLAZING & DOOR DETAILS
A.630	PARTITION TYPES
A.631	UL FIRE RATED ASSEMBLIES
INTERIOR DETAILS	
A.701	INTERIOR ELEVATIONS
A.702	INTERIOR ELEVATIONS
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A.711	MILLWORK DETAILS
A.730	STANDARD MOUNTING, LOCATIONS & TOILET ROOM CONFIGURATION
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A.820	TYPICAL DOOR TYPES, SCHEDULES & HARDWARE TYPES
A.821	DOOR DETAILS
A.830	SIGNAGE SCHEDULE
A.840	GLAZING SCHEDULE, FRAME TYPES & INTERIOR GLAZING DETAILS
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S101	GENERAL STRUCTURAL CRITERIA
S201	DEMO PLAN
S202	FOUNDATION PLAN
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MECHANICAL	
M0.1	MECHANICAL ABBREVIATIONS AND SYMBOLS
M0.2	MECHANICAL COMCHECK
M0.3	MECHANICAL COMCHECK
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E0.2	ELECTRICAL SYMBOLS
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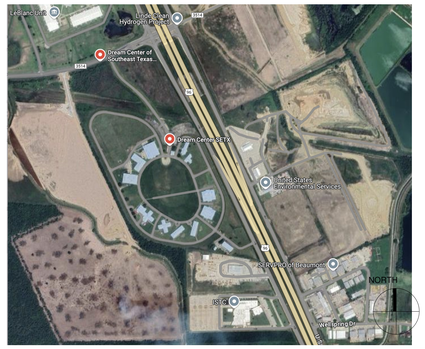
E2.2	LIGHT FIXTURES CUT SHEET
E2.3	LIGHTING CONTROLS DIAGRAMS/SCHEDULES

SHEET INDEX 5



VICINITY MAP 4

GENERAL SCOPE OF WORK

THIS PROJECT CONSISTS OF REMOVATING AND REDESIGNING AN ABANDONED JUVENILE DETENTION FACILITY INTO A DIVERSION CENTER

SPECIFIC SCOPE OF WORK

PROJECT WORK INCLUDES DEMOLITION OF FINISHES AND PARTITIONS, ADDITION OF STRUCTURAL STEEL AND CONCRETE TO SUPPORT MODIFICATION OF EXISTING SPACES, REFINISHING AND COSMETIC ALTERATIONS OF INDIVIDUAL UNITS FOR SHORT-TERM RESIDENTIAL OCCUPATION INCLUDING ADDITION OF CASEWORK AND MILLWORK UNITS; ADAPTIVE REUSE OF SHARED SPACES AND FACILITIES INCLUDING SHARED KITCHENS, BATHROOM AND SHOWER FACILITIES, STORAGE ROOMS, AND "DAY ROOM" ACTIVITY CENTERS. EXTERIOR MODIFICATIONS TO IMPROVE THERMAL PERFORMANCE AND INTERIOR COMFORT INCLUDE FACADE AND WINDOW REPLACEMENT AND NEW ROOF. NEW MECHANICAL EQUIPMENT, PLUMBING, FIRE SPRINKLER SYSTEMS, ELECTRICAL AND LIGHTING SYSTEMS.

PROJECT DESCRIPTION 3

SHEET INDEX 1

SHEET NUMBER	SHEET NAME
E3.1	POWER PLAN - LEVEL 1
E3.2	HVAC MEZZANINE POWER PLAN
E4.1	SINGLE-LINE DIAGRAM/CALCS
E5.1	PANELBOARD SCHEDULES
E5.2	PANELBOARD SCHEDULES
E7.1	LIGHTING COMCHECK
PLUMBING	
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P1.2	PLUMBING - WATER
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FIRE SAFETY	
FS.01	FIRE SPRINKLER PLAN - LEVEL 1
FS.02	FIRE SPRINKLER PLAN - MEZZANINE
TECHNOLOGY	
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T.100	OVERALL FIRST FLOOR PLAN - COMMUNICATIONS
T.401	GENERAL DETAILS - COMMUNICATIONS
SECURITY	
SC.001	LEGEND AND NOTES - SECURITY
SC.010	SITE PLAN - SECURITY
SC.100	OVERALL FIRST FLOOR PLAN - SECURITY
SC.301	DOOR ELEVATION DETAILS - SECURITY
SC.401	GENERAL DETAILS - SECURITY
SC.402	GENERAL DETAILS - SECURITY

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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AV/IT CONSULTANT
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AUSTIN, TX 78759
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SEAL:

REGISTERED ARCHITECT FERNANDO L. BRAVE 14292 STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

INDEX & GENERAL INFO

Scale: AS NOTED

G.001

1. PROJECT DESCRIPTION:

Project Name:	Jefferson County Diversion Center
Project Location:	3890 FM 3514, Beaumont, TX 77705
B/A Project No.:	23141
Analysis By:	Mili Mehta
Date(s):	08/23/2024

2. GOVERNING AGENCY(s): Jefferson County, TX

3. GOVERNING CODE(s): Jefferson County, TX.

Building :	2021 International Building Code
Mechanical:	2021 International Mechanical Code
Electrical:	2020 National Electrical Code
Plumbing:	2021 Uniform Plumbing Code
Fire:	2021 International Fire Code
Accessibility:	2012 Texas Accessibility Standards (TAS/ADAAG) w/ Latest Amendments
Energy:	2021 International Energy Code

4. ZONING DISTRICT: Not Applicable

5. FIRE DISTRICT: Not Applicable

6. RISK CATEGORY: Table 1604.5,

Risk Category III Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300

7. SNOW LOAD: Figure 1608.2

Zero

8. ULTIMATE DESIGN WIND SPEEDS & WIND-BORNE DEBRIS STATUS:

148 mph, Ultimate Category III, Exposure C

9. EARTHQUAKE LOADS: Section 1613

Not Applicable

10. PROPERTY RESTRICTIONS AND REQUIREMENTS:

FEMA
Flood Zone C – Area of Minimal Flooding (No Shading) (48038S0280C Flood Map)

11. OCCUPANCY CLASSIFICATION: Section 308

Primary: Residential R-4 (six - 16 receiving custodial care)

12. MIXED USE AND OCCUPANCY: Section 303 and 508

420.2 Separation walls. Walls separating dwelling units in the same building, walls separating sleeping units in the same building and walls separating dwelling or sleeping units from other occupancies contiguous to them in the same building shall be constructed as fire partitions in accordance with Section 708.

420.4 Automatic sprinkler system. Group I-1 occupancies shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.2.6.

13. AUTOMATIC SPRINKLER SYSTEMS - Section 903

903.2.6 Group I.
An automatic sprinkler system shall be provided throughout buildings with a Group I fire area.

Exceptions:

1.An automatic sprinkler system installed in accordance with Section 903.3.1.2 shall be permitted in Group I-1, Condition 1 facilities.
2. An automatic sprinkler system is not required where Group I-4 day care facilities are at the level of exit discharge and where every room where care is provided has not fewer than one exterior exit door.
3. In buildings where Group I-4 day care is provided on levels other than the level of exit discharge, an automatic sprinkler system in accordance with Section 903.3.1.1 shall be installed on the entire floor where care is provided, all floors between the level of care and the level of exit discharge, and all floors below the level of exit discharge other than areas classified as an open parking garage.

14. FIRE PUMPS - Section 913

15. GENERAL BUILDING HEIGHT AND AREA LIMITATIONS – Section 504 & 506

Table 504.3 ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

Occupancy Classification		*Type of construction*
	See footnote	*IIB*
I-1	S	*75*

506.2.1Single-occupancy, one-story buildings.
The allowable area of a single occupancy building with no more than one *story above grade plane* shall be determined in accordance with Equation 5-1:

$$A_a = A_t + (NS \times I_f) \quad \text{(Equation 5-1)}$$

where:
A_a = Allowable area (square feet).
A_t = Tabular allowable area factor (NS, S1, S13R or S13D value, as applicable) in accordance with Table 506.2.
NS = Tabular allowable area factor in accordance with Table 506.2 for non-sprinklered building (regardless of whether the building is sprinklered).
I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

Table 506.2 ALLOWABLE AREA FACTOR A_t IN SQUARE FEET[a, b]

Occupancy Classification		*Type of construction*
	See footnote	*IIB*
I-1	S1	*40,000*

16. ALLOWABLE BUILDING HEIGHT, AREA, AND ALLOWABLE NUMBER OF STORIES
See Table 504.3 Allowable Building Height in feet above grade plane.
See Table 504.4 Allowable Number of Stories above grade plane

Type IIB (Sprinklered)	Height (LF)	Number of Stories	Area (SF per story)
Group I-1	75	2	40,000

17. ACTUAL BUILDING HEIGHT & AREA:

Actual Building Height = 24' - 6"

Floor	A Occ/SF
1.	17,450
Canopy	1,302
TOTAL	**18,752**

18. TYPES OF CONSTRUCTION: Chapter 6

Type IIB (Sprinklered)
All wood blocking to be fire-retardant-treated.

19. FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS:
Table 601

Building Element	*Fire-Resistance Rating*
	IIB
Primary Structural Frame (Note: g) (See Section 202)	*0*
Bearing Walls	
Exterior (Notes: f, g)	*0*
Interior	*0*
Nonbearing walls/partitions - Exterior	***See Table 602***
Nonbearing walls/partitions – Interior (Note: e)	*0*
Floor Construction & associated secondary members (See Section 202)	*0*
Roof Construction & associated secondary members (See Section 202)	*0 (Note: c)*

Notes:
c. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.
e. Not less than the fire-resistance rating required by other sections of this code.
f. Not less than the fire-resistance rating based on fire separation distance (see Table 602).
g. Not less than the fire-resistance rating as referenced in Section 704.10

20. [F] TABLE 509 INCINDENTAL USES

ROOM OR AREA	SEPERATION AND/PROTECTION

21 FIRE RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE: Table 705.5

Type of Construction:	IIB (Fully Sprinklered)
Occupancy Group:	**I-1**
Wall Protection Fire Rating (Hour(s))	
x < 5'	1
5' < x < 10'	1
10' < x < 30'	0
x ≥ 30'	0

Exterior walls and openings in *exterior walls* shall comply with Tables 601 and 602. The distance to an adjacent *lot line* shall be determined in accordance with Table 602 and Section 705.

22. EXTERIOR WALL PROJECTIONS: Section 705

705.1 General. Exterior walls shall comply with this section.

705.2 Projections. Cornices, eave overhangs, exterior balconies and similar projections extending beyond the exterior wall shall conform to the requirements of this section and Section 1406. Exterior egress balconies and exterior exit stairways and ramps shall comply with Sections 1021 and 1027, respectively. Projections shall not extend any closer to the line used to determine the fire separation distance than shown in Table 705.2.

Table 705.2 MINIMUM DISTANCE OF PROJECTION

FIRE SEPARATION DISTANCE (FSD)	MIN. DIST. FROM LINE USED TO DETERMINE FSD
0 feet to less than 2 feet	Projections not permitted
2 feet to less than 3 feet	24 inches
3 feet to less than 30 feet	Two-thirds of FSD
5 feet or greater	40 inches

705.2.1 Types I and II construction. Projections from walls of Type I and II construction shall be of noncombustible materials or combustible materials as allowed by Section 705.2.3.1 and 705.2.4.

705.5 Fire-resistance ratings. Exterior walls shall be fire-resistance rated in accordance with Table 601, based on the type of construction, and Table 705.5, based on the fire separation distance. The required fire-resistance rating of exterior walls with a fire separation distance of greater than 10 feet (3048 mm) shall be rated for exposure to fire from the inside. The required fire-resistance rating of exterior walls with a fire separation distance of less than or equal to 10 feet (3048 mm) shall be rated for exposure to fire from both sides.

705.8 Openings. Opening in exterior walls shall comply with Sections 705.8.1 through 705.8.6 (see below)

23. MAXIMUM AREA OF EXTERIOR WALL OPENINGS: Table 705.8
Based on Fire Separation Distance and Degree of Opening Protection

Fire Separation Distance	Degree of Opening Protection % of Wall Protected(P) Sprinklered (UP, S)	Degree of Opening Protection	% Wall Unprotected,
0 < 3'	Not Permitted	Not Permitted	
3' < 5'	15	15	
5' < 10'	25	25	
10' < 15'	45	45	
15' < 20'	75	75	
20' < 25'	No Limit	No Limit	
25' < 30'	No Limit	No Limit	
30' or more	Not Required	Not Required	

Notes:
a: Values indicated are the percentage of the area of the exterior wall, per story.

24. ROOF ASSEMBLIES AND ROOFTOP STRUCTURES - Section 1505

Table 1505.1 - Minimum Roof Covering Classification
Types of Construction: Class C – Existing to Remain

26. JOINTS AND VOIDS: Section 715

715.1 General
The provisions of this section shall govern the materials and methods of construction used to protect joints and voids in or between horizontal and vertical assemblies.

715.2 Installation.
Systems or materials protecting joints and voids shall be securely installed in accordance with the manufacturer's installation instructions in or on the joint or void for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gasses. Fire-resistant joint systems or systems used to protect voids at exterior curtain walls and fire-resistance-rated floor intersections shall also be installed in accordance with the listing criteria.

715.3 Fire-resistance-rated assembly intersections.
Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which the system is installed.

Exceptions: Fire-resistant joint systems shall not be required for joints in the following locations:

6. Mezzanine floors
7. Walls that are permitted to have unprotected openings
8. Roofs where openings are permitted

28. OCCUPANT LOAD – Section 1004
Table 1004.1.1 – Maximum Floor Area Allowances per Occupant

Function of Space	Occupant Load Factor (sf/occupant)
Accessory storage areas, mech. equipment room	300 gross
Assembly w/o fixed seats	
Unconcentrated (tables and chairs)	15 net
Business areas	100 gross
Institutional areas	
Sleeping areas	120 gross

ACTUAL BUILDING OCCUPANT LOAD.	**OCCUPANT LOAD**
Level 1	
Business areas (100 gross)	26
Accessory storage areas, mech. equipment room (300 gross)	17
Assembly w/o fixed seats	
Unconcentrated (tables and chairs):	310
Institutional areas	
Sleeping areas	64
TOTAL Bldg. Life Safety Occupant Load	**417**

(Life Safety egress widths and number of exits shall use this number)

OCCUPANT LOAD NOTE: Life Safety egress widths and number of exits shall use this number.

1004.9 Posting of occupant load.

Every room or space that is an assembly occupancy shall have the *occupant load* of the room or space posted in a conspicuous place, near the main exit or *exit access* doorway from the room or space, for the intended configurations. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or the owner's authorized agent.

29. MEANS OF EGRESS SIZING – Section 1005: existing to remain

1005.3.2 Other egress components

The capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant.

Exceptions

For other than Group H and I-2 occupancies, the capacity, in inches, of means of egress stairways shall be calculated by multiplying the occupant load served by such stairway by a means of egress capacity factor of .2 inch per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 AND an emergency voice/alarm communication system in accordance with Section 907.5.2.2.)

Calculated Egress Exit Required Width: Library

Other Egress Components 417 occupants x .15 = 62.55"

Actual Egress Exit Width: See Plans for Locations

12 exit doors of 36" provided = 432" of Other Egress Components
TOTAL = 432" of Other Egress Components

1005.4 Continuity.

The minimum width or required capacity of the *means of egress* required from any story of a building shall not be reduced along the path of egress travel until arrival at the public way.

1005.5 Distribution of minimum width and required capacity.

Where more than one *exit*, or access to more than one *exit*, is required, the *means of egress* shall be configured such that the loss of any one *exit*, or access to one *exit*, shall not reduce the available capacity or width to less than 50 percent of the required capacity or width.

1005.7 Encroachment

Encroachments into the required *means of egress* width shall be in accordance with the provisions of this section.

1005.7.1 Doors

Doors, when fully opened, shall not reduce the required width by more than 7 inches (178 mm). Doors in any position shall not reduce the required width by more than one-half.
Exceptions

1.Surface-mounted latch release hardware shall be exempt from inclusion in the 7-inch maximum (178 mm) encroachment where both of the following conditions exist:
1.1. The hardware is mounted to the side of the door facing away from the adjacent wall where the door is in the open position.
1.2. The hardware is mounted not less than 34 inches (865 mm) nor more than 48 inches (1219 mm) above the finished floor.

1005.7.2 Other projections.

Handrail projections shall be in accordance with the provisions of Section 1014.8. Other nonstructural projections such as trim and similar decorative features shall be permitted to project into the required width not more than 1½ inches (38 mm) on each side.

30 NUMBER OF EXITS AND EXIT ACCESS DOORWAYS – Section 1006

1006.2.1 Egress based on occupant load and common path of egress travel distance.

Two *exits* or *exit access doorways* from any space shall be provided where the design *occupant load* or the *common path of egress* travel distance exceeds the values listed in Table 1006.2.1.

TABLE 1006.2.1 SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT	MAXIMUM COMMON PATH OF			OCCUPANT
LOAD	EGRESS TRAVEL DISTANCE (feet)			OF SPACE	
Occupant Load	System(feet)	Without Sprinkler System(feet)	With Sprinkler OL ≤ 30	OL > 30	
I-1	10	NP	NP	75a	

a. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where automatic sprinkler systems are permitted in accordance with Section 903.3.1.2.

1006.3.1 Egress based on occupant load

Each story and occupied roof shall have the minimum number of independent *exits*, or access to *exits*, as specified in Table 1006.3.1. A single *exit* or access to a single *exit* shall be permitted in accordance with Section 1006.3.2. The required number of *exits* or *exit access stairways* or *ramps* providing access to *exits*, from any story or occupied roof shall be maintained until arrival at the *exit discharge* or a *public way*.

OCCUPANT LOAD PER STORY	MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS
1-500	2

34. EXIT ACCESS TRAVEL DISTANCE – Section 1017

1017.2 Limitations
Exit access travel distance shall not exceed the values given in Table 1017.2.

OCCUPANCY	WITH SPRINKLERSYSTEM (feet)
I-1	250b

b. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.

1017.3 Measurement. Exit access travel distance shall be measured from the most remote point within a story along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an exit.

35. PROTECTION OF INTERIOR WALLS: See Table 803.9

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY (note k)
SPRINKLERED (note l)

Group	Interior exit stairways and ramps and exit passageways (notes a, b)	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces (note c)
I-1	B	C	C

Notes:
1. Class C interior finish materials shall be permitted in rooms with a capacity of four persons or less.

803.1.1 Interior wall and ceiling finish materials. Interior wall and ceiling finish materials shall be classified in accordance with ASTM E 84 or UL 723. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed indexes.

Class A: = Flame spread index 0-25; smoke-developed index 0-450
Class B: = Flame spread index 26-75; smoke-developed index 0-450
Class C: = Flame spread index 76-200; smoke-developed index 0-450

36. CORRIDORS: Section 1020

1020.1 Construction.
Corridors serving as an exit access component in a means of egress system shall comply with the requirements of Sections 1020.2 through 1020.7

Table 1020.2 Corridor Fire-resistance Rating

Occupancy	Occupant Load Served by Corridor	Required Fire Resistance Rating Without Sprinkler System
I-1	All	1

Width and Capacity - Section 1020.3

Table 1020.4 MINIMUM CORRIDOR WIDTH
Any facility – 44"

1020.5 Dead ends.

Where more than one *exit* or *exit access doorway* is required, the *exit access* shall be arranged such that there are no dead ends in *corridors* more than 20 feet (6096 mm) in length.

Exceptions:
1. In occupancies in Group I-3 of Condition 2, 3 or 4, the dead end in a *corridor* shall not exceed 50 feet (15 240 mm).
2. In occupancies in Groups B, E, F, I-1, M, R-1, R-2, R-4, S and U, where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the length of the dead-end *corridors* shall not exceed 50 feet (15 240 mm).
3. A dead-end *corridor* shall not be limited in length where the length of the dead-end *corridor* is less than 2.5 times the least width of the dead-end *corridor*.

37. INTERIOR ENVIRONMENT: Chapter 12

1208.1 Minimum Room Widths. Habitable spaces, other than a kitchen, shall be not less than 7 feet in any plan dimension. Kitchens shall have a clear passageway of not less than 3 feet between counters fronts and appliances or counter fronts and walls.

1208.2 Minimum Ceiling Height. Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches above the finished floor. Bathrooms, toilet rooms, kitchens, storage rooms, and laundry rooms shall have a ceiling height of not less than 7 feet above the finished floor.

Exception:
2. If any room in a building has a sloped ceiling, the prescribed ceiling height for the room is required in one-half the area thereof. Any portion of the room measuring less than 5 feet from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.

1208.1 Furred ceiling. Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet.

1208.3 Room Area: Every dwelling unit shall have not less than one room that shall have not less than 120 square feet of net floor area. Other habitable rooms shall have a net floor area of not less than 70 square feet

38. Minimum Uniformly Distributed Live Loads, and Minimum Concentrated Live Loads
See Table 1607.1.

Occupancy or Use	Uniform Load (psf)	Concentrated Load (lbs.)
Access floor systems		
• Office use	50	2,000
• Computer use	100	2,000
Assembly		
• Lobbies	100[a]	-
• Other Areas	100[a]	-
• Moveable Seats	100[a]	-
Corridors (First Floor)	100	-
Handrails, guards and grab bars	See Section 1607.8	
Office Buildings	50	2,000
• Corridors above first floor	80	2,000
• File & computer rooms shall be designed for heavier loads based on anticipated occupancy	-	-
Lobbies and first-floor corridors	100	2,000
• Offices	50	2,000
Ordinary flat, pitched, and curved roofs (that are not occupiable)	-	20
Yards and terraces, pedestrians	100	

Notes:
b. The loading applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:
1.The nominal book stack unit height shall not exceed 90 inches.
2.The nominal shelf depth shall not exceed 12 inches for each face.
3.Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches wide.
f. The minimum concentrated load on stair treads shall be applied on an area of 2 inches by 2 inches. This load need not be assumed to act concurrently with the uniform load.
m. Live load reduction is not permitted unless specific exceptions of Section 1607.10 apply.
n. Live load reduction is only permitted in accordance with Section 1607.11.1.2 or Item 1 of Section 1607.11.2.

1607.9 Loads on handrails, guards, grab bars and seats.

Handrails and guards shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1 Grab bars, shower seats and accessible benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2.

1609.9.1 Handrails and guards.
Handrails and guards shall be designed to resist a linear load of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. Glass handrail assemblies and guards shall comply with Section 2407.

Exceptions:
1.For one- and two-family dwellings, only the single concentrated load required by Section 1607.8.1.1 shall be applied.
2.In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

1607.9.1.1 Concentrated load.
Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7.

1607.9.2 Guard component loads.
Balusters, penal fillers and guard infill components, including all rails except the handrail and the top rail, shall be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.

1607.9.2 Grab bars, shower seats and accessible benches.
Grab bars, shower seats and accessible benches shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point on the grab bar, shower seat, or seat of the accessible bench so as to produce the maximum load effects.

39. PLUMBING SYSTEMS / MINIMUM PLUMBING FACILITIES:

Chapter 29 / Section 2902 **AND TOILET AND BATHROOM REQUIREMENTS:** Chapter 12 / Section 1210 (p. 298)

1210.1 Required fixtures. The number and type of plumbing fixture provided in any occupancy shall comply with Chapter 29

1210.2 Finish materials. Walls, floors and partitions in toilet and bathrooms shall comply with Sections 1210.2.1 through 1210.2.4

1210.2.1 Floors and wall bases. In other than dwelling units, toilet, bathing and shower room floor finish materials shall have a smooth, hard, nonabsorbent surface. The intersections of such floors with walls shall have a smooth, hard, nonabsorbent, vertical base that extends upward onto the walls not less than 4 inches.

1210.2.2 Walls and partitions. Walls and partitions within 2 feet of service sinks, urinals, and water closets shall have a smooth, hard, nonabsorbent surface, to a height of not less than 4 feet above the floor, and except for structural eleme

TABLE C402.1.3 OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD[a, b, c]

CLIMATE ZONE	1 All other	1 Group R	2 All other	2 Group R	3 All other	3 Group R	4 EXCEPT MARINE All other	4 EXCEPT MARINE Group R	5 AND MARINE 4 All other	5 AND MARINE 4 Group R	6 All other	6 Group R	7 All other	7 Group R	8 All other	8 Group R
Roofs																
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal buildings[d]	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-20 + R-11 LS	R-20 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49
Walls, above grade																
Mass[e]	R-5.7ci[f]	R-5.7ci[f]	R-5.7ci[f]	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13ci + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13+ R-19.5ci	R-13+ R-19.5ci
Metal framed	R-13 + R-6ci	R-13 + R-6ci	R-13 + R-6ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13 + R17.5ci
Wood framed and other	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + R-5.6ci or R-20	R-13 + 7.5ci or R-20 + R-3.8ci	R-13 + 7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-15.6ci or R-20 + R-7.5ci	R-13 + R-15.6ci or R-20 + R-7.5ci	R13 + R-15.6ci or R-13.6ci or R-20 + R-10ci	R13 + R-15.6ci or R-13.6ci or R-20 + R-10ci
Walls, below grade																
Below-grade wall[g]	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci	R-12.5ci
Floors																
Mass[e]	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-16.7ci	R-16.7ci	R-16.7ci	R-16.7ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38[f]	R-38[f]	R-38[f]	R-38[f]
Slab-on-grade floors																
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10.5ci for 24" below	R-10.5ci for 24" below	R-10.5ci for 24" below	R-10.5ci for 24" below	R-10.5ci for 24" below	R-10.5ci for 24" below	R-15.5ci for 24" below	R-15.5ci for 24" below	R-15.5ci for 24" below	R-20.5ci for 24" below
Heated slabs[f]	R-7.5 for 12" below + R-5.5 all	R-7.5 for 12" below + R-5.5 all	R-7.5 for 12" below + R-5.5 all	R-7.5 for 12" below + R-5.5 all	R-10.5ci for 24" below + R-5.5 all	R-10.5ci for 24" below + R-5.5 all	R-15.5ci for 24" below + R-5.5 all	R-15.5ci for 24" below + R-5.5 all	R-15.5ci for 24" below + R-5.5 all	R-15.5ci for 24" below + R-5.5 all	R-20.5ci for 36" below + R-5.5 all	R-20.5ci for 36" below + R-5.5 all	R-20.5ci for 48" below + R-5.5 all	R-20.5ci for 48" below + R-5.5 all	R-20.5ci for 48" below + R-5.5 all	R-20.5ci for 48" below + R-5.5 all
Opaque doors																
Nonswinging	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.
a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
b. Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4.
c. Where using the component performance alternative per Section C402.1.5 to comply with the mass wall requirements, the wall mass shall be considered to be greater than or equal to the mass wall requirements listed in the following locations:
1. Mass walls in climate zones 1 through 6 shall be considered to be greater than or equal to the minimum requirements where the wall has a heat capacity of at least 7 Btu/ft²·°F.
2. Mass walls in climate zones 7 and 8 shall be considered to be greater than or equal to the minimum requirements where the wall has a heat capacity of at least 13 Btu/ft²·°F.
d. Where insulation is installed between framing members such as purlins, the reported R-value shall be permitted to be adjusted in accordance with Section C402.2.3.
e. Where the mass wall R-value or heat capacity requirement can be met with the insulation on the interior, exterior or integral to the wall, the insulation shall be permitted to be placed in any configuration that meets the criteria.
f. "Mass walls" shall be in accordance with Section C402.2.3.
g. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.
h. Not applicable to garage doors. See Table C402.1.4.

JC DIVERSION CENTER RENOVATION

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09/23/2024

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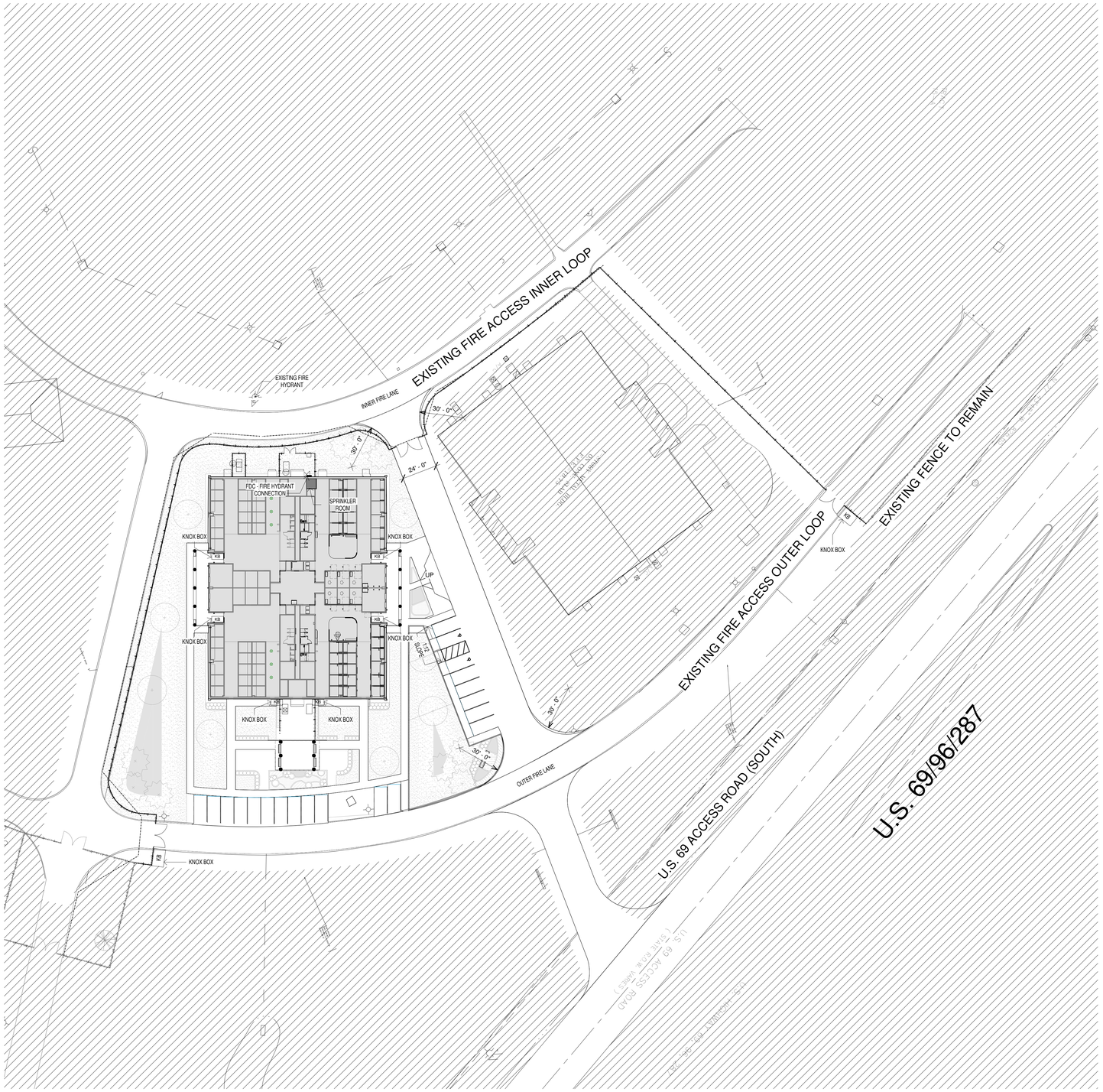
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

CODE REVIEW

Scale: AS NOTED

G.010



LIFE SAFETY SITE PLAN — 1/32" = 1'-0" — 5

NOTES:

1. ARROWS DESIGNATE DIRECTION OF EGRESS
2. FULLY FIRE SPRINKLERED. REFER TO FIRE SPRINKLER DRAWINGS.

GENERAL NOTES — 2

EXIT SIGN; RE: MEP FIXTURE SCHEDULE

EXIT TRAVEL DISTANCE - MAXIMUM 250'

COMMON PATH OF TRAVEL - MAXIMUM 75'

75' RADIUS

FIRE EXTINGUISHER CABINET LOCATION TYP.

NOT IN SCOPE

FIRE HYDRANT

FIRE EXTINGUISHER CABINET

KB — KNOX BOX

FDC

LIFE SAFETY LEGEND — 1

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SEAL:

REGISTERED ARCHITECT
FERNANDO L. BRAVE
14297
STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

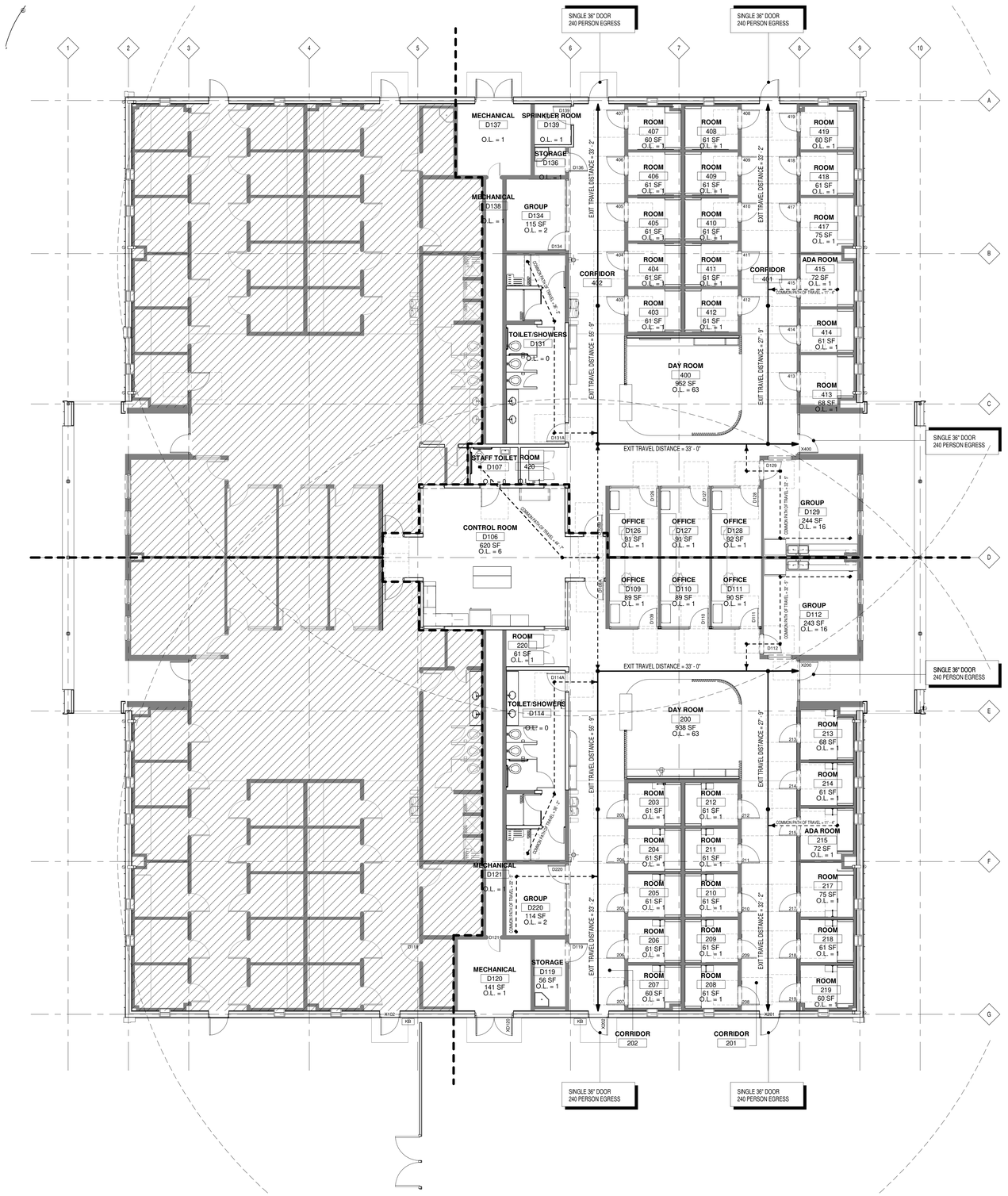
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

LIFE SAFETY SITE PLAN

Scale: AS NOTED

G.011



FIRST FLOOR PLAN 1/8" = 1'-0" 5

OCCUPANCY LOAD MATRIX POD 200

ROOM NUMBER	ROOM NAME	AREA	OCCUPANCY TYPE	OCCUPANCY FACTOR	O.L.
ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM					
220	ROOM	61 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D119	STORAGE	56 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D120	MECHANICAL	141 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D121	MECHANICAL	136 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
TOTAL:					**4**
ASSEMBLY W/O FIXED SEATS					
200	DAY ROOM	938 SF	ASSEMBLY W/O FIXED SEATS	15	63
D112	GROUP	243 SF	ASSEMBLY W/O FIXED SEATS	15	16
TOTAL:					**79**
BUSINESS AREAS					
D106	CONTROL ROOM	620 SF	BUSINESS AREAS	150	6
D109	OFFICE	89 SF	BUSINESS AREAS	150	1
D110	OFFICE	89 SF	BUSINESS AREAS	150	1
D111	OFFICE	90 SF	BUSINESS AREAS	150	1
D220	GROUP	114 SF	BUSINESS AREAS	150	2
TOTAL:					**11**
SLEEPING AREAS					
203	ROOM	61 SF	SLEEPING AREAS	120	1
204	ROOM	61 SF	SLEEPING AREAS	120	1
205	ROOM	61 SF	SLEEPING AREAS	120	1
206	ROOM	61 SF	SLEEPING AREAS	120	1
207	ROOM	60 SF	SLEEPING AREAS	120	1
208	ROOM	61 SF	SLEEPING AREAS	120	1
209	ROOM	61 SF	SLEEPING AREAS	120	1
210	ROOM	61 SF	SLEEPING AREAS	120	1
211	ROOM	61 SF	SLEEPING AREAS	120	1
212	ROOM	61 SF	SLEEPING AREAS	120	1
213	ROOM	68 SF	SLEEPING AREAS	120	1
214	ROOM	61 SF	SLEEPING AREAS	120	1
215	ADA ROOM	72 SF	SLEEPING AREAS	120	1
217	ROOM	75 SF	SLEEPING AREAS	120	1
218	ROOM	61 SF	SLEEPING AREAS	120	1
219	ROOM	60 SF	SLEEPING AREAS	120	1
TOTAL:					**16**

OCCUPANCY LOAD MATRIX POD 400

ROOM NUMBER	ROOM NAME	AREA	OCCUPANCY TYPE	OCCUPANCY FACTOR	O.L.
ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM					
420	ROOM	46 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D136	STORAGE	23 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D137	MECHANICAL	141 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D138	MECHANICAL	117 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
D139	SPRINKLER ROOM	40 SF	ACCESSORY STORAGE AREAS, MECH. EQUIPMENT ROOM	300	1
TOTAL:					**5**
ASSEMBLY W/O FIXED SEATS					
400	DAY ROOM	952 SF	ASSEMBLY W/O FIXED SEATS	15	63
D129	GROUP	244 SF	ASSEMBLY W/O FIXED SEATS	15	16
TOTAL:					**79**
BUSINESS AREAS					
D126	OFFICE	91 SF	BUSINESS AREAS	150	1
D127	OFFICE	91 SF	BUSINESS AREAS	150	1
D128	OFFICE	92 SF	BUSINESS AREAS	150	1
D134	GROUP	115 SF	BUSINESS AREAS	150	2
TOTAL:					**5**
SLEEPING AREAS					
403	ROOM	61 SF	SLEEPING AREAS	120	1
404	ROOM	61 SF	SLEEPING AREAS	120	1
405	ROOM	61 SF	SLEEPING AREAS	120	1
406	ROOM	61 SF	SLEEPING AREAS	120	1
407	ROOM	60 SF	SLEEPING AREAS	120	1
408	ROOM	61 SF	SLEEPING AREAS	120	1
409	ROOM	61 SF	SLEEPING AREAS	120	1
410	ROOM	61 SF	SLEEPING AREAS	120	1
411	ROOM	61 SF	SLEEPING AREAS	120	1
412	ROOM	61 SF	SLEEPING AREAS	120	1
413	ROOM	68 SF	SLEEPING AREAS	120	1
414	ROOM	61 SF	SLEEPING AREAS	120	1
415	ADA ROOM	72 SF	SLEEPING AREAS	120	1
417	ROOM	75 SF	SLEEPING AREAS	120	1
418	ROOM	61 SF	SLEEPING AREAS	120	1
419	ROOM	60 SF	SLEEPING AREAS	120	1
TOTAL:					**16**

TOTAL AREA: 8048 SF **TOTAL OCCUPANTS: 215**

NOTES:

1. ARROWS DESIGNATE DIRECTION OF EGRESS
2. ELECTRONIC LOCKS, SPRINKLERS AND FIRE ALARM SHALL BE SUBMITTED.
3. REFER TO SPRINKLERS AND FIRE ALARM DRAWINGS.

GENERAL NOTES AND OCCUPANCY LOADS 2

EXIT SIGN; RE: MEP FIXTURE SCHEDULE

EXIT TRAVEL DISTANCE - MAXIMUM 250'

COMMON PATH OF TRAVEL - MAXIMUM 75'

75' RADIUS

FIRE EXTINGUISHER CABINET LOCATION TYP.

NOT IN SCOPE

FIRE HYDRANT

FIRE EXTINGUISHER CABINET

KB KNOX BOX

FDC

LIFE SAFETY LEGEND 1

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ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

LIFE SAFETY FLOOR PLAN

Scale: AS NOTED

G.012

CHAPTER 3: BUILDING BLOCKS

302 Floor or Ground Surfaces

302.2 Carpet. Carpet or carpet tile shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height shall be 1/2 inch (13 mm) maximum. Exposed edges of carpet shall be fastened to floor surfaces and shall have trim on the entire length of the exposed exposed edge. Carpet edge trim shall comply with 303.

½ max
13

Figure 302.2 Carpet Pile Height

302.3 Openings. Openings in floor or ground surfaces shall not allow passage of a sphere more than 1/2 inch (13 mm) diameter except as allowed in 407.4.3, 409.4.3, 410.4, 810.5.3 and 810.10. Elongated openings shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

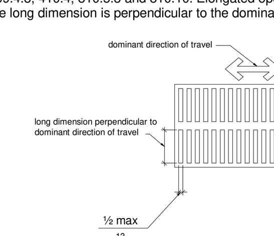


Figure 302.3 Elongated Openings in Floor or Ground Surfaces

303.2 Vertical. Changes in level of 1/4 inch (6.4 mm) high maximum shall be permitted to be vertical.

¼ max
6.4

Figure 303.2 Vertical Change in Level

303.3 Beveled. Changes in level between 1/4 inch (6.4 mm) high minimum and 1/2 inch (13 mm) high maximum shall be beveled with a slope not steeper than 1:2.

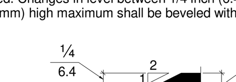


Figure 303.3 Beveled Change in Level

304 Turning Space

304.3.1 Circular Space. The turning space shall be a space of 60 inches (1525 mm) diameter minimum. The space shall be permitted to include knee and toe clearance complying with 306.

304.3.2 T-Shaped Space. The turning space shall be a T-shaped space within a 60 inch (1525 mm) square minimum with arms and base 36 inches (915 mm) wide minimum. Each arm of the T shall be clear of obstructions 12 inches (305 mm) minimum in each direction and the base shall be clear of obstructions 24 inches (610 mm) minimum. The space shall be permitted to include knee and toe clearance complying with 306 only at the end of either the base or one arm.

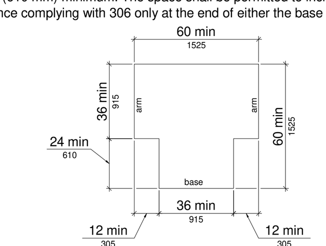


Figure 304.3.2 T-Shaped Turning Space

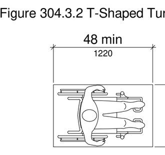


Figure 305.3 Clear Floor or Ground Space

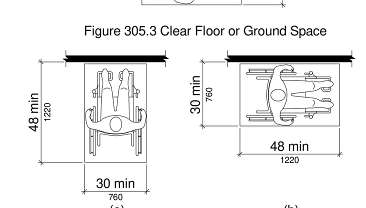


Figure 305.5 Position of Clear Floor or Ground Space

305.7.1 Forward Approach. Alcoves shall be 36 inches (915 mm)wide minimum where the depth exceeds 24 inches (610 mm).

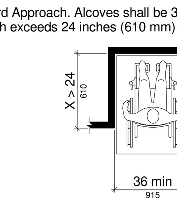


Figure 305.7.1 Maneuvering Clearance in an Alcove, Forward Approach

305.7.2 Parallel Approach. Alcoves shall be 60 inches (1525 mm) wide minimum where the depth exceeds 15 inches (380 mm).

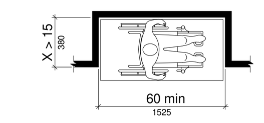


Figure 305.7.2 Maneuvering Clearance in an Alcove, Parallel Approach

306 Knee and Toe Clearance

306.2 Toe Clearance.

306.2.1 General. Space under an element between the finish floor or ground and 9 inches (230 mm) above the finish floor or ground shall be considered toe clearance and shall comply with 306.2.

306.2.2 Maximum Depth. Toe clearance shall extend 25 inches (635 mm) maximum under an element.

306.2.3 Minimum Required Depth. Where toe clearance is required at an element as part of a clear floor space, the toe clearance shall extend 17 inches (430 mm) minimum under the element.

306.2.4 Additional Clearance. Space extending greater than 6 inches (150 mm) beyond the available knee clearance at 9 inches (230 mm) above the finish floor or ground shall not be considered toe clearance.

306.2.5 Width. Toe clearance shall be 30 inches (760 mm) wide minimum.

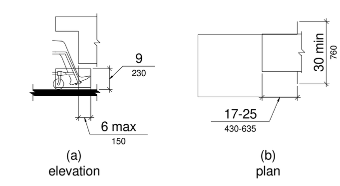


Figure 306.2 Toe Clearance

306.3 Knee Clearance.

306.3.1 General. Space under an element between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground shall be considered knee clearance and shall comply with 306.3.

306.3.2 Maximum Depth. Knee clearance shall extend 25 inches (635 mm) maximum under an element at 9 inches (230 mm) above the finish floor or ground.

306.3.3 Minimum Required Depth. Where knee clearance is required under an element as part of a clear floor space, the knee clearance shall be 11 inches (280 mm) deep minimum at 9 inches (230 mm) above the finish floor or ground, and 8 inches (205 mm) deep minimum at 27 inches (685 mm) above the finish floor or ground.

306.3.4 Clearance Reduction. Between 9 inches (230 mm) and 27 inches (685 mm) above the finish floor or ground, the knee clearance shall be permitted to reduce at a rate of 1 inch (25 mm) in depth for each 6 inches (150 mm) in height.

306.3.5 Width. Knee clearance shall be 30 inches (760 mm) wide minimum.

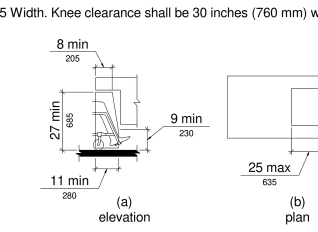


Figure 306.3 Knee Clearance

307 Protruding Objects

307.2 Protrusion Limits. Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the finish floor or ground shall protrude 4 inches (100 mm) maximum horizontally into the circulation path.

EXCEPTION: Handrails shall be permitted to protrude 4 1/2 inches (115 mm) maximum.

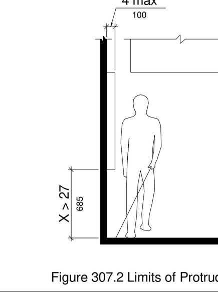


Figure 307.2 Limits of Protruding Objects

307.3 Post-Mounted Objects. Free-standing objects mounted on posts or pylons shall overhang circulation paths 12 inches (305 mm) maximum when located 27 inches (685 mm) minimum and 80 inches (2030 mm) maximum above the finish floor or ground. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm), the lowest edge of such sign or obstruction shall be 27 inches (685 mm) minimum or 80 inches (2030 mm) minimum above the finish floor or ground.

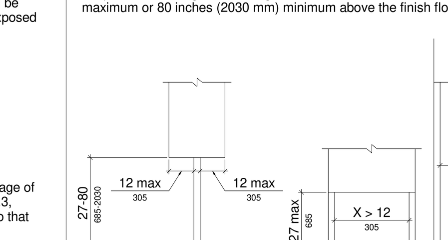


Figure 307.3 Post-Mounted Protruding Objects

307.4 Vertical Clearance. Vertical clearance shall be 80 inches (2030 mm) high minimum. Guardrails or other barriers shall be provided where the vertical clearance is less than 80 inches (2030 mm) high. The leading edge of such guardrail or barrier shall be located 27 inches (685 mm) maximum above the finish floor or ground.

EXCEPTION: Door closers and door stops shall be permitted to be 78 inches (1980 mm) minimum above the finish floor or ground.

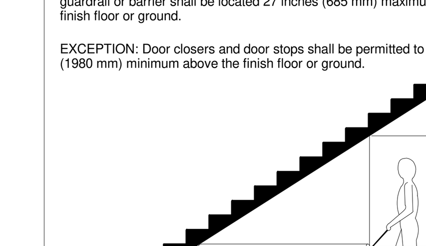


Figure 307.4 Vertical Clearance

308 Reach Ranges

Children's Reach Ranges

Forward or Side Reach	High (maximum)	Low (minimum)
Ages 3 and 4	36 in (915 mm)	20 in (510 mm)
Ages 5 through 8	40 in (1015 mm)	18 in (455 mm)
Ages 9 through 12	44 in (1120 mm)	16 in (405 mm)

308.2 Forward Reach.

308.2.1 Unobstructed. Where a forward reach is unobstructed, the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the finish floor or ground.

308.2.2 Obstructed High Reach. Where a high forward reach is over an obstruction, the clear floor space shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches (1220 mm) maximum where the reach depth is 20 inches (510 mm) maximum. Where the reach depth exceeds 20 inches (510 mm), the high forward reach shall be 44 inches (1120 mm) maximum and the reach depth shall be 25 inches (635 mm) maximum.

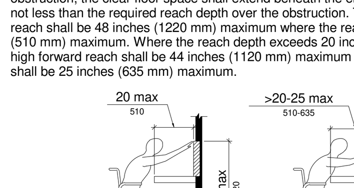
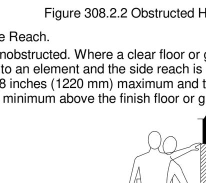


Figure 308.2.2 Obstructed High Forward Reach

308.3 Side Reach.

308.3.1 Unobstructed. Where a clear floor or ground space allows a parallel approach to an element and the side reach is unobstructed, the high side reach shall be 48 inches (1220 mm) maximum and the low side reach shall be 15 inches (380 mm) minimum above the finish floor or ground.



308.3.2 Obstructed High Reach. Where a clear floor or ground space allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches (865 mm) maximum and the depth of the obstruction shall be 24 inches (610 mm) maximum. The high side reach shall be 48 inches (1220 mm) maximum for a reach depth of 10 inches (255 mm) maximum. Where the reach depth exceeds 10 inches (255 mm), the high side reach shall be 46 inches (1170 mm) maximum for a reach depth of 24 inches (610 mm) maximum.

309 Operable Parts

309.2 Clear Floor Space. A clear floor or ground space complying with 305 shall be provided.

309.3 Height. Operable parts shall be placed within one or more of the reach ranges specified in 308.

309.4 Operation. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N) maximum.

CHAPTER 4: ACCESSIBLE ROUTES

402.2 Components. Accessible routes shall consist of one or more of the following components: walking surfaces with a running slope not steeper than 1:20, doorways, ramps, curb ramps excluding the flared sides, elevators, and platform lifts. All components of an accessible route shall comply with the applicable requirements of Chapter 4.

Advisory 402.2 Components. Walking surfaces must have running slopes not steeper than 1:20, see 403.3. Other components of accessible routes, such as ramps (405) and curb ramps (406), are permitted to be more steeply sloped.

403 Walking Surfaces 403.1 General. Walking surfaces that are a part of an accessible route shall comply with 403.

403.2 Floor or Ground Surface. Floor or ground surfaces shall comply with 302.

403.3 Slope. The running slope of walking surfaces shall not be steeper than 1:20. The cross slope of walking surfaces shall not be steeper than 1:48.

403.4 Changes in Level. Changes in level shall comply with 303.

403.5 Clearances. Walking surfaces shall provide clearances complying with 403.5.
EXCEPTION: Within employee work areas, clearances on common use circulation paths shall be permitted to be decreased by work area equipment provided that the decrease is essential to the function of the work being performed.
403.5.1 Clear Width. Except as provided in 403.5.2 and 403.5.3, the clear width of walking surfaces shall be 36 inches (915 mm) minimum.

EXCEPTION: The clear width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided that reduced width segments are separated by segments that are 48 inches (1220 mm) long minimum and 36 inches (915 mm) wide minimum.

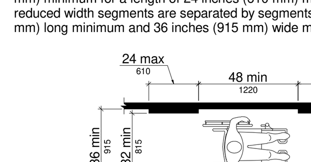


Figure 403.5.1 Clear Width of an Accessible Route

403.5.2 Clear Width at Turn. Where the accessible route makes a 180 degree turn around an element which is less than 48 inches (1220 mm) wide, clear width shall be 42 inches (1065 mm) minimum approaching the turn, 48 inches (1220 mm) minimum at the turn and 42 inches (1065 mm) minimum leaving the turn.

403.5.3 Passing Spaces. An accessible route with a clear width less than 60 inches (1525 mm) shall provide passing spaces at intervals of 200 feet (61 m) maximum.

404 Doors, Doorways, and Gates

404.2.3 Clear Width. Door openings shall provide a clear width of 32 inches (815 mm) minimum. Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees. Openings more than 24 inches (610 mm) deep shall provide a clear opening of 36 inches (915 mm) minimum. There shall be no projections into the required clear opening width lower than 34 inches (865 mm) above the finish floor or ground. Projections into the clear opening width between 34 inches (865 mm) and 80 inches (2030 mm) above the finish floor or ground shall not exceed 4 inches (100 mm).

404.2.4 Maneuvering Clearances. Minimum maneuvering clearances at doors and gates shall comply with 404.2.4. Maneuvering clearances shall extend the full width of the doorway and the required latch side or hinge side clearance.

404.2.4.3 Recessed Doors and Gates. Maneuvering clearances for forward approach shall be provided when any obstruction within 18 inches (455 mm) of the latch side of a doorway projects more than 8 inches (205 mm) beyond the face of the door, measured perpendicular to the face of the door or gate.

404.2.6 Doors in Series and Gates in Series. The distance between two hinged or pivoted doors in series and gates in series shall be 48 inches (1220 mm) minimum plus the width of doors or gates swinging into the space.

404.2.7 Door and Gate Hardware. Handles, pulls, latches, locks, and other operable parts on doors and gates shall comply with 309.4. Operable parts of such hardware shall be 34 inches (865 mm) minimum and 48 inches (1220 mm) maximum above the finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.

404.2.8.1 Door Closers and Gate Closers. Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

404.2.8.2 Spring Hinges. Door and gate spring hinges shall be adjusted so that from the open position of 70 degrees, the door or gate shall move to the closed position in 1.5 seconds minimum.

404.2.9 Door and Gate Opening Force. Fire doors shall have a minimum opening force allowable by the appropriate administrative authority. The force for pushing or pulling open a door or gate other than fire doors shall be as follows:

1. Interior hinged doors and gates: 5 pounds (22.2 N) maximum.
2. Sliding or folding doors: 5 pounds (22.2 N) maximum.

These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door or gate in a closed position.

404.2.10 Door and Gate Surfaces. Swinging door and gate surfaces within 10 inches (255 of the finish floor or ground measured vertically shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch (1.6 mm) of the same plane as the other. Cavities created by added kick plates shall be capped.

404.2.11 Vision Lights. Doors, gates, and side lights adjacent to doors or gates, containing one or more glazing panels that permit viewing through the panels shall have the bottom of at least one glazed panel located 43 inches (1090 mm) maximum above the finish floor.
404.3 Automatic and Power-Assisted Doors and Gates. Automatic doors and automatic gates shall comply with 404.3. Full-powered automatic doors shall comply with ANSI/BHMA A156.10 (incorporated by reference, see "Referenced Standards" in Chapter 1). Low-energy and power-assisted doors shall comply with ANSI/BHMA A156.19 (1997 or 2002 edition) (incorporated by reference, see "Referenced Standards" in Chapter 1).

404.3.2 Maneuvering Clearance. Clearances at power-assisted doors and gates shall comply with 404.2.4. Clearances at automatic doors and gates without standby power and serving an accessible means of egress shall comply with 404.2.4.

404.3.7 Revolving Doors, Revolving Gates, and Turnstiles. Revolving doors, revolving gates, and turnstiles shall not be part of an accessible route.

405 Ramps

405.2 Slope. Ramp runs shall have a running slope not steeper than 1:12.

405.3 Cross Slope. Cross slope of ramp runs shall not be steeper than 1:48.

405.5 Clear Width. The clear width of a ramp run and, where handrails are provided, the clear width between handrails shall be 36 inches (915 mm) minimum.
405.6 Rise. The rise for any ramp run shall be 30 inches (760 mm) maximum.

405.7 Landings. Ramps shall have landings at the top and the bottom of each ramp run. Landings shall comply with 405.7.

405.7.1 Slope. Landings shall have slope no steeper than 1:48. Changes in level are not permitted.

405.7.2 Width. The landing clear width shall be at least as wide as the widest ramp run leading to the landing.

405.7.3 Length. The landing clear length shall be 60 inches (1525 mm) long minimum.

405.7.4 Change in Direction. Ramps that change direction between runs at landings shall have a clear landing 60 inches (1525 mm) minimum by 60 inches (1525 mm) minimum.

405.7.5 Doorways. Where doorways are located adjacent to a ramp landing, maneuvering clearances required by 404.2.4 and 404.3.2 shall be permitted to overlap the required landing

405.8 Handrails. Ramp runs with a rise greater than 6 inches (150 mm) shall have handrails complying with 505.

405.9 Edge Protection. Edge protection complying with 405.9.1 or 405.9.2 shall be provided on each side of ramp runs and at each side of ramp landings.

405.9.1 Extended Floor or Ground Surface. The floor or ground surface of the ramp run or landing shall extend 12 inches (305 mm) minimum beyond the inside face of a handrail complying with 505.

405.9.2 Curb or Barrier. A curb or barrier shall be provided that prevents the passage of a 4 inch (100 mm) diameter sphere, where any portion of the sphere is within 4 inches (100 mm) of the finish floor or ground surface.

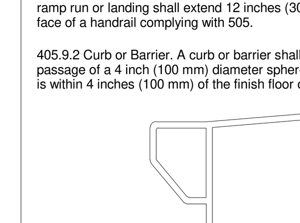


Figure 405.9.2 Curb or Barrier Edge Protection

406 Curb Ramps

406.1 General. Curb ramps on accessible routes shall comply with 406, 405.2 through 405.5, and 405.10.

406.2 Counter Slope. Counter slopes of adjoining gutters and road surfaces immediately adjacent to the curb ramp shall not be steeper than 1:20. The adjacent surfaces at transitions at curb ramps to walks, gutters, and streets shall be at the same level.

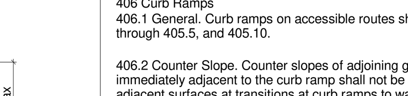


Figure 406.2 Counter Slope of Surfaces Adjacent to Curb Ramps

406.3 Sides of Curb Ramps. Where provided, curb ramp flares shall not be steeper than 1:10.

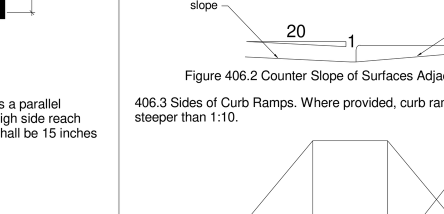


Figure 406.3 Sides of Curb Ramps

406.4 Landings. Landings shall be provided at the tops of curb ramps. The landing clear length shall be 36 inches (915 mm) minimum. The landing clear width shall be at least as wide as the curb ramp, excluding flared sides, leading to the landing.

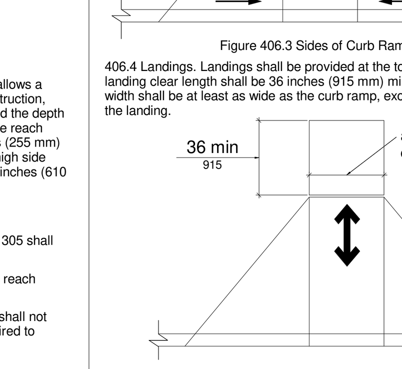


Figure 406.4 Landings at the Top of Curb Ramps

406.5 Location. Curb ramps and the flared sides of curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles. Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides.

406.6 Diagonal Curb Ramps. Diagonal or corner type curb ramps with returned curbs or other well-defined edges shall have the edges parallel to the direction of pedestrian flow. The bottom of diagonal curb ramps shall have a clear space 48 inches (1220 mm) minimum outside active traffic lanes of the roadway. Diagonal curb ramps provided at marked crossings shall provide the 48 inches (1220 mm) minimum clear space within the markings. Diagonal curb ramps with flared sides shall have a segment of curb 24 inches (610 mm) long minimum located on each side of the curb ramp and within the marked crossing.

406.7 Islands. Raised islands in crossings shall be cut through level with the street or have curb ramps at both sides. Each curb ramp shall have a level area 48 inches (1220 mm) long minimum by 36 inches (915 mm) wide minimum at the top of the curb ramp in the part of the island intersected by the crossings. Each 48 inch (1220 mm) minimum by 36 inch (915 mm) minimum area shall be oriented so that the 48 inch (1220 mm) minimum length is in the direction of the running slope of the curb ramp it serves. The 48 inch (1220 mm) minimum by 36 inch (915 mm) minimum areas and the accessible route shall be permitted to overlap.

407 Elevators

407.1 General. Elevators shall comply with 407 and with ASME A17.1 (incorporated by reference, see "Referenced Standards" in Chapter 1). They shall be passenger elevators as classified by ASME A17.1. Elevator operation shall be automatic. EXCEPTION: Existing conditions don't have to comply

407.2.1.2 Size. Call buttons shall be 3/4 inch (19 mm) minimum in the smallest dimension.

407.2.2.1 Visible and Audible Signals. A visible and audible signal shall be provided at each hoistway entrance to indicate which car is answering a call and the car's direction of travel. Where in-car signals are provided, they shall be visible from the floor area adjacent to the hall call buttons.

407.2.2.2 Visible Signals. Visible signal fixtures shall be centered at 72 inches (1830 mm) minimum above the finish floor or ground. The visible signal elements shall be 2 1/2 inches (64 mm) minimum measured along the vertical centerline of the element. Signals shall be visible from the floor area adjacent to the hall call button.

407.2.3.1 Floor Designation. Floor designations complying with 703.2 and 703.4.1 shall be provided on both jambs of elevator hoistway entrances. Floor designations shall be provided in both tactile characters and braille. Tactile characters shall be 2 inches (51 mm) high minimum. A tactile star shall be provided on both jambs at the main entry level.

407.2.3.2 Car Designations. Destination-oriented elevators shall provide tactile car identification complying with 703.2 on both jambs of the hoistway immediately below the floor designation. Car designations shall be provided in both tactile characters and braille. Tactile characters shall be 2 inches (51 mm) high minimum.

407.3.3.1 Height. The device shall be activated by sensing an obstruction passing through the opening at 5 inches (125 mm) nominal and 29 inches (735 mm) nominal above the finish floor.

407.3.3.3 Duration. Door reopening devices shall remain effective for 20 seconds minimum.

407.3.4 Door and Signal Timing. The minimum acceptable time from notification that a car is answering a call or notification of the car assigned at the means for the entry of destination information until the doors of that car start to close shall be calculated from the following equation:

T = D/(1.5 ft/s) or T = D/(455 mm/s) = 5 seconds minimum where T equals the total time in seconds and D equals the distance (in feet or millimeters) from the point in the lobby or corridor 60 inches (1525 mm) directly in front of the farthest call button controlling that car to the centerline of its hoistway door.

407.3.5 Door Delay. Elevator doors shall remain fully open in response to a car call for 3 seconds 407.3.6 Width. The width of elevator doors shall comply with Table 407.4.1.
407.4 Elevator Car Requirements. Elevator cars shall comply with 407.4.
407.4.1 Car Dimensions. Inside dimensions of elevator cars and clear width of elevator doors shall comply with Table 407.4.1.

407.4.3 Platform to Hoistway Clearance. The clearance between the car platform sill and the edge of any hoistway landing shall be 1 1/4 inch (32 mm) maximum.

407.4.4 Leveling. Each car shall be equipped with a self-leveling feature that will automatically bring and maintain the car at floor landings within a tolerance of 1/2 inch (13 mm) under rated loading to zero loading conditions.

407.4.5 Illumination. The level of illumination at the car controls, platform, car threshold and car landing sill shall be 5 foot candles (54 lux) minimum.

407.4.6 Elevator Car Controls. Where provided, elevator car controls shall comply with 407.4.6 and 309.4.
407.4.6.1 Location. Controls shall be located within one of the reach ranges specified in 308.
407.4.6.2 Buttons. Car control buttons with floor designations shall comply with 407.4.6.2 and shall be raised or flush.

407.4.6.2.1 Size. Buttons shall be 3/4 inch (19 mm) minimum in their smallest dimension.

407.4.6.4.1 Height. Emergency control buttons shall have their centerlines 35 inches (890 mm) minimum above the finish floor.

407.4.7.1.1 Type. Control buttons shall be identified by tactile characters complying with 703.2.

407.4.7.1.3 Symbols. The control button for the emergency stop, alarm, door open, door close, main entry floor, and phone, shall be identified with tactile symbols as shown in Table 407.4.7.1.3.

407.4.8.1.1 Size. Characters shall be 1/2 inch (13 mm) high minimum.

407.4.8.2.2 Signal Level. The verbal annunciator shall be 10 dB minimum above ambient, but shall not exceed 80 dB, measured at the annunciator.

407.4.8.2.3 Frequency. The verbal annunciator shall have a frequency of 300 Hz minimum to 3000 Hz maximum.

410 Platform Lifts
410.1 General. Platform lifts shall comply with ASME A18.1 (1999 edition or 2003 edition) (incorporated by reference, see "Referenced Standards" in Chapter 1). Platform lifts shall not be attendant-operated and shall provide unassisted entry and exit from the lift.

Advisory 410.1 General. Inclined stairway chairlifts and inclined and vertical platform lifts are available for short-distance vertical transportation. Because an accessible route requires an 80 inch (2030 mm) vertical clearance, care should be taken in selecting lifts as they may not be equally suitable for use by people using wheelchairs and people standing. If a lift does not provide 80 inch (2030 mm) vertical clearance, it cannot be considered part of an accessible route in new construction.

The ADA and other Federal civil rights laws require that accessible features be maintained in working order so that they are accessible to and usable by those people they are intended to benefit. Building owners are reminded that the ASME A18 Safety Standard for Platform Lifts and Stairway Chairlifts requires routine maintenance and inspections. Isolated or temporary interruptions in service due to maintenance or repairs may be unavoidable; however, failure to take prompt action to effect repairs could constitute a violation of Federal laws and these requirements.
410.2 Floor Surfaces. Floor surfaces in platform lifts shall comply with 302 and 303.
410.3 Clear Floor Space. Clear floor space in platform lifts shall comply with 305.

410.4 Platform to Runway Clearance. The clearance between the platform sill and the edge of any runway landing shall be 1 inch (32 mm) maximum.

410.5 Operable Parts. Controls for platform lifts shall comply with 309.

410.6 Doors and Gates. Platform lifts shall have low-energy power-operated doors or gates complying with 404.3. Doors shall remain open for 20 seconds minimum. End doors and gates shall provide a clear width 32 inches (815 mm) minimum. Side doors and gates shall provide a clear width 42 inches (1065 mm) minimum.

EXCEPTION: Platform lifts serving two landings maximum and having doors or gates on opposite sides shall be permitted to have self-closing manual doors or gates.

501 General
501.1 Scope. The provisions of Chapter 5 shall apply where required by Chapter 2 or where referenced by a requirement in this document.

502 Parking Spaces
502.1 General. Car and van parking spaces shall comply with 502. Where parking spaces are marked with lines, width measurements of parking spaces and access aisles shall be made from the centerline of the markings.

EXCEPTION: Where parking spaces or access aisles are not adjacent to another parking space or access aisle, measurements shall be permitted to include the full width of the line defining the parking space or access aisle.

502.2 Vehicle Spaces. Car parking spaces shall be 96 inches (2440 mm) wide minimum and van parking spaces shall be 132 inches (3350 mm) wide minimum, shall be marked to define the width, and shall have an adjacent access aisle complying with 502.3.

EXCEPTION: Van parking spaces shall be permitted to be 96 inches (2440 mm) wide minimum where the access aisle is 96 inches (2440 mm) wide minimum.

502.3 Access Aisle. Access aisles serving parking spaces shall comply with 502.3. Access aisles shall adjoin an accessible route. Two parking spaces shall be permitted to share a common access aisle.

502.3.1 Width. Access aisles serving car and van parking spaces shall be 60 inches (1525 mm) wide minimum.

502.3.2 Length. Access aisles shall extend the full length of the parking spaces they serve.

502.3.3 Marking. Access aisles shall be marked so as to discourage parking in them.

502.3.4 Location. Access aisles shall not overlap the vehicular way. Access aisles shall be permitted to be placed on either side of the parking space except for angled van parking spaces which shall have access aisles located on the passenger side of the parking spaces.

502.4 Floor or Ground Surfaces. Parking spaces and access aisles serving them shall comply with 302. Access aisles shall be at the same level as the parking spaces they serve. Changes in level are not permitted. EXCEPTION: Slopes not steeper than 1:48 shall be permitted.

502.5 Vertical Clearance. Parking spaces for vans and access aisles and vehicular routes serving them shall provide a vertical clearance of 98 inches (2490 mm) minimum.

502.6 Identification. Parking space identification signs shall include the International Symbol of Accessibility complying with 703.7.2.1. Signs identifying van parking spaces shall contain the designation "van accessible." Signs shall be 60 inches (1525 mm) minimum above the finish floor or ground surface measured to the bottom of the sign.

502.7 Relationship to Accessible Routes. Parking spaces and access aisles shall be designed so that cars and vans, when parked, cannot obstruct the required clear width of adjacent accessible routes.

503 Passenger Loading Zones

503.2 Vehicle Pull-Up Space. Passenger loading zones shall provide a vehicular pull-up space 96 inches (2440 mm) wide minimum and 20 feet (6100 mm) long minimum.

503.3 Access Aisle. Passenger loading zones shall provide access aisles complying with 503 adjacent to the vehicle pull-up space. Access aisles shall adjoin an accessible route and shall not overlap the vehicular way.

503.3.1 Width. Access aisles serving vehicle pull-up spaces shall be 60 inches (1525 mm) wide minimum.

503.3.2 Length. Access aisles shall extend the full length of the vehicle pull-up spaces they serve.

503.3.3 Marking. Access aisles shall be marked so as to discourage parking in them.

503.4 Floor and Ground Surfaces. Vehicle pull-up spaces and access aisles serving them shall comply with 302. Access aisles shall be at the same level as the vehicle pull-up space they serve. Changes in level are not permitted.
EXCEPTION: Slopes not steeper than 1:48 shall be permitted.

503.5 Vertical Clearance. Vehicle pull-up spaces, access aisles serving them, and a vehicular route from an entrance to the passenger loading zone, and from the passenger loading zone to a vehicular exit shall provide a vertical clearance of 114 inches (2895 mm) minimum.

504 Stairways
504.1 General. Stairs that are part of the means of egress is required to comply with 504

504.2 Treads and Risers. All steps on a flight of stairs shall have uniform riser heights and uniform tread depths. Risers shall be 4 inches (100 mm) high minimum and 7 inches (180 mm) high maximum. Treads shall be 11 inches (280 mm) deep minimum.
504.3 Open Risers. Open risers are not permitted.

504.4 Tread Surface. Stair treads shall comply with 302. Changes in level are not permitted.

504.5 Nosings. The radius of curvature at the leading edge of the tread shall be 1/2 inch (13 mm) maximum. Nosings that project beyond risers shall have the underside of the leading edge curved or beveled. Risers shall be permitted to slope under the tread at an angle of 30 degrees maximum from vertical. The permitted projection of the nosing shall extend 1 1/2 inches (38 mm) maximum over the tread below.

505.2 Where Required. Handrails shall be provided on both sides of stairs and ramps.

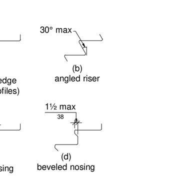


Figure 504.5 Stair Nosings

504.6 Handrails. Stairs shall have handrails complying with 505.

504.7 Wet Conditions. Stair treads and landings subject to wet conditions shall be designed to prevent the accumulation of water.

505 Handrails
505.1 General. Handrails provided along walking surfaces complying with 403, required at ramps complying with 405, and required at stairs complying with 504 shall comply with 505.

Advisory 505.1 General. Handrails are required on ramp runs with a rise greater than 6 inches (150 mm) (see 405.8) and on certain stairways (see 504). Handrails are not required on walking surfaces with running slopes less than 1:20. However, handrails are required to comply with 505 when they are provided on walking surfaces with running slopes less than 1:20 (see 403.6). Sections 505.2, 505.3, and 505.10 do not apply to handrails provided on walking surfaces with running slopes less than 1:20 as these sections only reference requirements for ramps and stairs.

505.3 Continuity. Handrails shall be continuous within the full length of each stair flight or ramp run. Inside handrails on switchback or dogleg stairs and ramps shall be continuous between flights or runs.

505.4 Height. Top of gripping surfaces of handrails shall be 34 inches (865 mm) minimum and 38 inches (965 mm) maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above walking surfaces, stair nosings, and ramp surfaces.

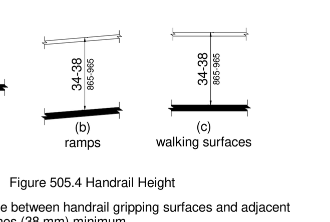


Figure 505.4 Handrail Height

505.5 Clearance. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1 1/2 inches (38 mm) minimum.

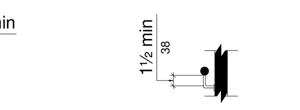


Figure 505.5 Handrail Clearance

Figure 505.6 Horizontal Projections Below Gripping Surface

505.6 Gripping Surface. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20 percent of their length. Where provided, horizontal projections shall occur 1 1/2 inches (38 mm) minimum below the bottom of the handrail gripping surface.

505.7.1 Circular Cross Section. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1 1/4 inches (32 mm) minimum and 2 inches (51 mm) maximum.

505.7.2 Non-Circular Cross Sections. Handrail gripping surfaces with a non-circular cross section shall have a perimeter dimension of 4 inches (100 mm) minimum and 6 1/4 inches (160 mm) maximum, and a cross-section dimension of 2 1/4 inches (57 mm) maximum.

505.8 Surfaces. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.

505.9 Fittings. Handrails shall not rotate within their fittings.

505.10 Handrail Extensions. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with 505.10.

505.10.1 Top and Bottom Extension at Ramps. Ramp handrails shall extend horizontally above the landing for 12 inches (305 mm) minimum beyond the top and bottom of ramp runs. Extensions shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent ramp run.

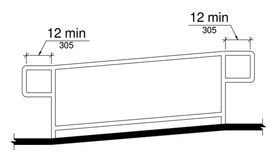


Figure 505.10.1 Top and Bottom Handrail Extension at Ramps

505.10.2 Top Extension at Stairs. At the top of a stair flight, handrails shall extend horizontally above the landing for 12 inches (305 mm) minimum beginning directly above the first riser nosing. Extensions shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent stair flight.

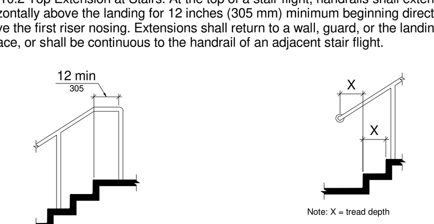


Figure 505.10.2 Top Handrail Extension at Stairs

Figure 505.10.3 Bottom Handrail Extension at Stairs

505.10.3 Bottom Extension at Stairs. At the bottom of a stair flight, handrails shall extend at the slope of the stair flight for a horizontal distance at least equal to one tread depth beyond the last riser nosing. Extension shall return to a wall, guard, or the landing surface, or shall be continuous to the handrail of an adjacent stair flight.

CHAPTER 6: PLUMBING ELEMENTS AND FACILITIES

602 Drinking Fountains

602.2 Clear Floor Space. Units shall have a clear floor or ground space complying with 305 positioned for a forward approach and centered on the unit. Knee and toe clearance complying with 306 shall be provided.

EXCEPTION: A parallel approach complying with 305 shall be permitted at units for children's use where the spout is 30 inches (760 mm) maximum above the finish floor or ground and is 3 1/2 inches (90 mm) maximum from the front edge of the unit, including bumpers.

602.3 Operable Parts. Operable parts shall comply with 309.

602.4 Spout Height. Spout outlets shall be 36 inches (915 mm) maximum above the finish floor or ground.

602.5 Spout Location. The spout shall be located 15 inches (380 mm) minimum from the vertical support and 5 inches (125 mm) maximum from the front edge of the unit, including bumpers.

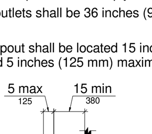


Figure 602.5 Drinking Fountain Spout Location

602.6 Water Flow. The spout shall provide a flow of water 4 inches (100 mm) high minimum and shall be located 5 inches (125 mm) maximum from the front of the unit. The angle of the water stream shall be measured horizontally relative to the front face of the unit. Where spouts are located less than 3 inches (75 mm) of the front of the unit, the angle of the water stream shall be 30 degrees maximum. Where spouts are located between 3 inches (75 mm) and 5 inches (125 mm) maximum from the front of the unit, the angle of the water stream shall be 15 degrees maximum.

602.7 Drinking Fountains for Standing Persons. Spout outlets of drinking fountains for standing persons shall be 38 inches (965 mm) minimum and 43 inches (1090
mm) maximum above the finish floor or ground.

603 Toilet and Bathing Rooms

603.2 Clearances. Clearances shall comply with 603.2.
603.2.1 Turning Space. Turning space complying with 304 shall be provided within the room.

603.2.2 Overlap. Required clear floor spaces, clearance at fixtures, and turning space shall be permitted to overlap.

603.2.3 Door Swing. Doors shall not swing into the clear floor space or clearance required for any fixture. Doors shall be permitted to swing into the required turning space.

603.3 Mirrors. Mirrors located above lavatories or countertops shall be installed with the bottom edge of the reflecting surface 40 inches (1015 mm) maximum above the finish floor or ground. Mirrors not located above lavatories or countertops shall be installed with the bottom edge of the reflecting surface 35 inches (890 mm) maximum above the finish floor or ground. 603.4 Coat Hooks and Shelves. Coat hooks shall be located within one of the reach ranges specified in 308. Shelves shall be located 40 inches (1015 mm) minimum and 48 inches (1220 mm) maximum above the finish floor.

604 Water Closets and Toilet Compartments

604.2 Location. The water closet shall be positioned with a wall or partition to the rear and to one side. The centerline of the water closet shall be 16 inches (405 mm) minimum to 18 inches (455 mm) maximum from the side wall or partition, except that the water closet shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum from the side wall or partition in the ambulatory accessible toilet compartment specified in 604.8.2. Water closets shall be arranged for a left-hand or right-hand approach.

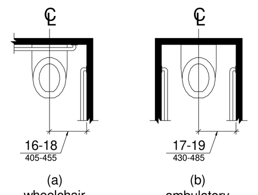


Figure 604.2 Water Closet Location

604.3.1 Size. Clearance around a water closet shall be 60 inches (1525 mm) minimum measured perpendicular from the side wall and 56 inches (1420 mm) minimum measured perpendicular from the rear wall.

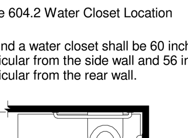


Figure 604.3.1 Size of Clearance at Water Closets

604.3.2 Overlap. The required clearance around the water closet shall be permitted to overlap the water closet, associated grab bars, dispensers, sanitary napkin disposal units, coat hooks, shelves, accessible routes, clear floor space and clearances required at other fixtures, and the turning space. No other fixtures or obstructions shall be located within the required water closet clearance.

604.4 Seats. The seat height of a water closet above the finish floor shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum measured to the top of the seat. Seats shall not be sprung to return to a lifted position.

604.5 Grab Bars. Grab bars for water closets shall comply with 609. Grab bars shall be provided on the side wall closest to the water closet and on the rear wall.

604.5.1 Side Wall. The side wall grab bar shall be 42 inches (1065 mm) long minimum, located 12 inches (305 mm) maximum from the rear wall and extending 54 inches (1370 mm) minimum from the rear wall.

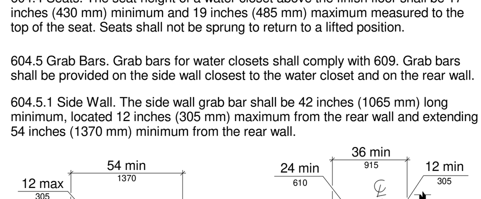


Figure 604.5.1 Side Wall Grab Bar at Water Closets

Figure 604.5.2 Rear Wall Grab Bar at Water Closets

604.5.2 Rear Wall. The rear wall grab bar shall be 36 inches (915 mm) long minimum and extend from the centerline of the water closet 12 inches (305 mm) minimum on one side and 24 inches (610 mm) minimum on the other side.

604.6 Flush Controls. Flush controls shall be hand operated or automatic. Flush controls shall comply with 309. Flush controls shall be located on the open side of the water closet except in ambulatory accessible compartments complying with 604.8.2.

604.7 Dispensers. Toilet paper dispensers shall comply with 309.4 and shall be 7 inches (180 mm) minimum and 9 inches (230 mm) maximum in front of the water closet measured to the centerline of the dispenser. The outlet of the dispenser shall be 15 inches (380 mm) minimum and 48 inches (1220 mm) maximum above the finish floor and shall not be located behind grab bars. Dispensers shall not be of a type that controls delivery or that does not allow continuous paper flow.

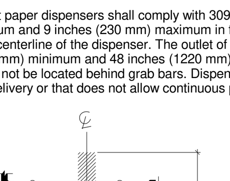


Figure 604.7 Dispenser Outlet Location

604.8 Toilet Compartments. Wheelchair accessible toilet compartments shall meet the requirements of 604.8.1 and 604.8.3. Compartments containing more than one plumbing fixture shall comply with 603. Ambulatory accessible compartments shall comply with 604.8.2 and 604.8.3.

604.8.1 Wheelchair Accessible Compartments. Wheelchair accessible compartments shall comply with 604.8.1.

604.8.1.1 Size. Wheelchair accessible compartments shall be 60 inches (1525 mm) wide minimum measured perpendicular to the side wall, and 56 inches (1420 mm) deep minimum for wall hung water closets and 59 inches (1500 mm) deep minimum for floor mounted water closets measured perpendicular to the rear wall. Wheelchair accessible compartments for children's use shall be 60 inches (1525 mm) wide minimum measured perpendicular to the side wall, and 59 inches (1500 mm) deep minimum for wall hung and floor mounted water closets measured perpendicular to the rear wall.

604.8.1.2 Doors. Toilet compartment doors, including door hardware, shall comply with 404 except that if the approach is to the latch side of the compartment door, clearance between the door side of the compartment and any obstruction shall be 42 inches (1065 mm) minimum. Doors shall be located in the front partition or in the side wall or partition farthest from the water closet. Where located in the front partition, the door opening shall be 4 inches (100 mm) maximum from the side wall or partition farthest from the water closet. Where located in the side wall or partition, the door opening shall be 4 inches (100 mm) maximum from the front partition. The door shall be self-closing. A door pull complying with 404.2.7 shall be placed on both sides of the door near the latch. Toilet compartment doors shall not swing into the minimum required compartment area.

604.8.1.3 Approach. Compartments shall be arranged for left-hand or right-hand approach to the water closet.

604.8.1.4 Toe Clearance. The front partition and at least one side partition shall provide a toe clearance of 9 inches (230 mm) minimum above the finish floor and 6 inches (150 mm) deep minimum beyond the compartment-side face of the partition, exclusive of partition support members. Compartments for children's use shall provide a toe clearance of 12 inches (305 mm) minimum above the finish floor.
EXCEPTION: Toe clearance at the front partition is not required in a compartment greater than 62 inches (1575 mm) deep with a wall-hung water closet or 65 inches (1650 mm) deep with a floor-mounted water closet. Toe clearance at the side partition is not required in a compartment greater than 66 inches (1675 mm) wide. Toe clearance at the front partition is not required in a compartment for children's use that is greater than 65 inches (1650 mm) deep

604.8.1.5 Grab Bars. Grab bars shall comply with 609. A side-wall grab bar complying with 604.5.1 shall be provided and shall be located on the wall closest to the water closet. In addition, a rear-wall grab bar complying with 604.5.2 shall be provided.

604.8.2 Ambulatory Accessible Compartments. Ambulatory accessible compartments shall comply with 604.8.2.

604.8.2.1 Size. Ambulatory accessible compartments shall have a depth of 60 inches (1525 mm) minimum and a width of 35 inches (890 mm) minimum and 37 inches (940 mm) maximum.

604.8.2.2 Doors. Toilet compartment doors, including door hardware, shall comply with 404, except that if the approach is to the latch side of the compartment door, clearance between the door side of the compartment and any obstruction shall be 42 inches (1065 mm) minimum. The door shall be self-closing. A door pull complying with 404.2.7 shall be placed on both sides of the door near the latch. Toilet compartment doors shall not swing into the minimum required compartment area.

604.8.2.3 Grab Bars. Grab bars shall comply with 609. A side-wall grab bar complying with 604.5.1 shall be provided on both sides of the compartment.

604.8.3 Coat Hooks and Shelves. Coat hooks shall be located within one of the reach ranges specified in 308. Shelves shall be located 40 inches (1015 mm) minimum and 48 inches (1220 mm) maximum above the finish floor.

604.9 Water Closets and Toilet Compartments for Children's Use. Water closets and toilet compartments for children's use shall comply with 604.9.

604.9.1 Location. The water closet shall be located with a wall or partition to the rear and to one side. The centerline of the water closet shall be 12 inches (305 mm) minimum and 18 inches (455 mm) maximum from the side wall or partition, except that the water closet shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum from the side wall or partition in the ambulatory accessible toilet compartment specified in 604.8.2. Compartments shall be arranged for left-hand or right-hand approach to the water closet.

604.9.2 Clearance. Clearance around a water closet shall comply with 604.3.

604.9.3 Height. The height of water closets shall be 11 inches (280 mm) minimum and 17 inches (430 mm) maximum measured to the top of the seat. Seats shall not be sprung to return to a lifted position.

604.9.4 Grab Bars. Grab bars for water closets shall comply with 604.5.

604.9.5 Flush Controls. Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with 309.2 and 309.4 and shall be installed 36 inches (915 mm) maximum above the finish floor. Flush controls shall be located on the open side of the water closet except in ambulatory accessible compartments complying with 604.8.2.

604.9.6 Dispensers. Toilet paper dispensers shall comply with 309.4 and shall be 7 inches (180 mm) minimum and 9 inches (230 mm) maximum in front of the water closet measured to the centerline of the dispenser. The outlet of the dispenser shall be 14 inches (355 mm) minimum and 19 inches (485 mm) maximum above the finish floor. There shall be a clearance of 1 1/2 inches (38 mm) minimum below the grab bar. Dispensers shall not be of a type that controls delivery or that does not allow continuous paper flow.

604.9.7 Toilet Compartments. Toilet compartments shall comply with 604.8.

605 Urinals

605.2 Height and Depth. Urinals shall be the stall-type or the wall-hung type with the rim 17 inches (430 mm) maximum above the finish floor or ground. Urinals shall be 13 1/2 inches (345 mm) deep minimum measured from the outer face of the urinal rim to the back of the fixture.

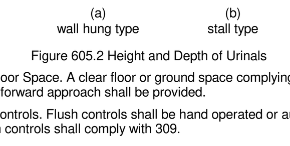


Figure 605.2 Height and Depth of Urinals

605.3 Clear Floor Space. A clear floor or ground space complying with 305 positioned for forward approach shall be provided.

605.4 Flush Controls. Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with 309.

606 Lavatories and Sinks

606.2 Clear Floor Space. A clear floor space complying with 305, positioned for a forward approach, and knee and toe clearance complying with 306 shall be provided.

606.3 Height. Lavatories and sinks shall be installed with the front of the higher of the rim or counter surface 34 inches (865 mm) maximum above the finish floor or ground.

606.4 Faucets. Controls for faucets shall comply with 309. Hand-operated metering faucets shall remain open for 10 seconds minimum.

606.5 Exposed Pipes and Surfaces. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks.

607 Bathtubs

607.2 Clearance. Clearance in front of bathtubs shall extend the length of the bathtub and shall be 30 inches (760 mm) wide minimum. A lavatory complying with 606 shall be permitted at the control end of the clearance. Where a permanent seat is provided at the head end of the bathtub, the clearance shall extend 12 inches (305 mm) minimum beyond the wall at the head end of the bathtub.

607.3 Seat. A permanent seat at the head end of the bathtub or a removable in-tub seat shall be provided. Seats shall comply with 610.

607.4 Grab Bars. Grab bars for bathtubs shall comply with 609 and shall be provided in accordance with 607.4.1 or 607.4.2.

607.4.1 Bathtubs With Permanent Seats. For bathtubs with permanent seats, grab bars shall be provided in accordance with 607.4.1.

607.4.1.1 Back Wall. Two grab bars shall be installed on the back wall, one located in accordance with 609.4 and the other located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the rim of the bathtub. Each grab bar shall be installed 15 inches (380 mm) maximum from the head end wall and 12 inches (305 mm) maximum from the control end wall.

607.4.1.2 Control End Wall. A grab bar 24 inches (610 mm) long minimum shall be installed on the control end wall at the front edge of the bathtub.

607.4.2 Bathtubs Without Permanent Seats. For bathtubs without permanent seats, grab bars shall comply with 607.4.2.

607.4.2.1 Back Wall. Two grab bars shall be installed on the back wall, one located in accordance with 609.4 and other located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the rim of the bathtub. Each grab bar shall be 24 inches (610 mm) long minimum and shall be installed 24 inches (610 mm) maximum from the head end wall and 12 inches (305 mm) maximum from the control end wall.

607.4.2.2 Control End Wall. A grab bar 24 inches (610 mm) long minimum shall be installed on the control end wall at the front edge of the bathtub.

607.4.2.3 Head End Wall. A grab bar 12 inches (305 mm) long minimum shall be installed on the head end wall at the front edge of the bathtub.

607.5 Controls. Controls, other than drain stoppers, shall be located on an end wall. Controls shall be between the bathtub rim and grab bar, and between the open side of the bathtub and the centerline of the width of the bathtub. Controls shall comply with 309.4.

607.6 Shower Spray Unit and Water. A shower spray unit with a hose 59 inches (1500 mm) long minimum that can be used both as a fixed-position shower head and as a hand-held shower shall be provided. The shower spray unit shall have an on/off control with a non-positive shut-off. If an adjustable-height shower head on a vertical bar is used, the bar shall be installed so as not to obstruct the use of grab bars. Bathtub shower spray units shall deliver water that is 120°F (49°C) maximum.

607.7 Bathtub Enclosures. Enclosures for bathtubs shall not obstruct controls, faucets, shower and spray units or obstruct transfer from wheelchairs onto bathtub seats or into bathtubs. Enclosures on bathtubs shall not have tracks installed on the rim of the open face of the bathtub.

608 Shower Compartments

608.2 Size and Clearances for Shower Compartments. Shower compartments shall have sizes and clearances complying with 608.2.

608.2.1 Transfer Type Shower Compartments. Transfer type shower compartments shall be 36 inches (915 mm) by 36 inches (915 mm) clear inside dimensions measured at the center points of opposing sides and shall have a 36 inch (915 mm) wide minimum entry on the face of the shower compartment. Clearance of 36 inches (915 mm) wide minimum by 48 inches (1220 mm) long minimum measured from the control wall shall be provided.

608.2.2 Standard Roll-In Type Shower Compartments. Standard roll-in type shower compartments shall be 30 inches (760 mm) wide minimum by 60 inches (1525 mm) deep minimum clear inside dimensions measured at center points of opposing sides and shall have a 60 inches (1525 mm) wide minimum entry on the face of the shower compartment.

608.2.2.1 Clearance. A 30 inch (760 mm) wide minimum by 60 inch (1525 mm) long minimum clearance shall be provided adjacent to the open face of the shower compartment.

608.2.3 Alternate Roll-In Type Shower Compartments. Alternate roll-in type shower compartments shall be 36 inches (915 mm) wide and 60 inches (1525 mm) deep minimum clear inside dimensions measured at center points of opposing sides. A 36 inch (915 mm) wide minimum entry shall be provided at one end of the long side of the compartment.

608.3 Grab Bars. Grab bars shall comply with 609 and shall be provided in accordance with 608.3. Where multiple grab bars are used, required horizontal grab bars shall be installed at the same height above the finish floor.

608.3.1 Transfer Type Shower Compartments. In transfer type compartments, grab bars shall be provided across the control wall and back wall to a point 18 inches (455 mm) from the control wall.

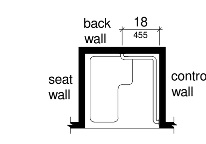


Figure 608.3.1 Grab Bars for Transfer Type Showers

608.3.2 Standard Roll-In Type Shower Compartments. Where a seat is provided in standard roll-in type shower compartments, grab bars shall be provided on the back wall and the side wall opposite the seat. Grab bars shall not be provided above the seat. Where a seat is not provided in standard roll-in type shower compartments, grab bars shall be provided on three walls. Grab bars shall be installed 6 inches (150 mm) maximum from adjacent walls.

608.3.3 Alternate Roll-In Type Shower Compartments. In alternate roll-in type shower compartments, grab bars shall be provided on the back wall and the side wall farthest from the compartment entry. Grab bars shall not be provided above the seat. Grab bars shall be installed 6 inches (150 mm) maximum from adjacent walls.

608.4 Seats. A folding or non-folding seat shall be provided in transfer type shower compartments. A folding seat shall be provided in roll-in type showers required in transient lodging guest rooms with mobility features complying with 806.2. Seats shall comply with 610.

608.5 Controls. Controls, faucets, and shower spray units shall comply with 309.4.

608.5.1 Transfer Type Shower Compartments. In transfer type shower compartments, the controls, faucets, and shower spray unit shall be installed on the side wall opposite the seat 38 inches (965 mm) minimum and 48 inches (1220 mm) maximum above the shower floor and shall be located on the control wall 15 inches (380 mm) maximum from the centerline of the seat toward the shower opening.

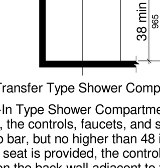


Figure 608.5.1 Transfer Type Shower Compartment Control Location

608.5.2 Standard Roll-In Type Shower Compartments. In standard roll-in type shower compartments, the controls, faucets, and shower spray unit shall be located above the grab bar, but no higher than 48 inches (1220 mm) above the shower floor. Where a seat is provided, the controls, faucets, and shower spray unit shall be installed on the back wall adjacent to the seat wall and shall be located 27 inches (685 mm) maximum from the seat wall.

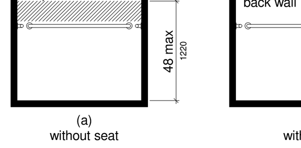


Figure 608.5.2 Standard Roll-In Type Shower Compartment Control Location

608.5.3 Alternate Roll-In Type Shower Compartments. In alternate roll-in type shower bar, but no higher than 48 inches (1220 mm) above the shower floor. Where a seat is provided, the controls, faucets, and shower spray unit shall be located on the side wall shower spray unit shall be installed on the side wall farthest from the compartment entry.

608.6 Shower Spray Unit and Water. A shower spray unit with a hose 59 inches (1500 mm) long minimum that can be used both as a fixed-position shower head and as a hand-held shower shall be provided. The shower spray unit shall have an on/off control with a non-positive shut-off. If an adjustable-height shower head on a vertical bar is used, the bar shall be installed so as not to obstruct the use of grab bars. Shower spray units shall deliver water that is 120°F (49°C) maximum.

608.7 Thresholds. Thresholds in roll-in type shower compartments shall be 1/2 inch (13 mm) high maximum in accordance with 303. In transfer type shower compartments, thresholds 1/2 inch (13 mm) high maximum shall be beveled, rounded, or vertical.

608.8 Shower Enclosures. Enclosures for shower compartments shall not obstruct controls, faucets, and shower spray units or obstruct transfer from wheelchairs onto shower seats.

609 Grab Bars

609.1 General. Grab bars in toilet facilities and bathing facilities shall comply with 609.

609.2 Cross Section. Grab bars shall have a cross section complying with 609.2.1 or 609.2.2.

609.2.1 Circular Cross Section. Grab bars with circular cross sections shall have an outside diameter of 1 1/4 inches (32 mm) minimum and 2 inches (51 mm) maximum.

609.2.2 Non-Circular Cross Section. Grab bars with non-circular cross sections shall have a cross-section dimension of 2 inches (51 mm) maximum and a perimeter dimension of 4 inches (100 mm) minimum and 4.8 inches (120 mm) maximum.

609.3 Spacing. The space between the wall and the grab bar shall be 1 1/2 inches (38 mm). The space between the grab bar and projecting objects below and at the ends shall be 1 1/2 inches (38 mm) minimum. The space between the grab bar and projecting objects above shall be 12 inches (305 mm) minimum.

609.4 Position of Grab Bars. Grab bars shall be installed in a horizontal position, 33 inches (840 mm) minimum and 36 inches (915 mm) maximum above the finish floor measured to the top of the gripping surface, except that at water closets for children's use complying with 604.9, grab bars shall be installed in a horizontal position 18 inches (455 mm) minimum and 27 inches (685 mm) maximum above the finish floor measured to the top of the gripping surface. The height of the lower grab bar on the back wall of a bathtub shall comply with 607.4.1.1 or 607.4.2.1.

609.5 Surface Hazards. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges.

609.6 Fittings. Grab bars shall not rotate within their fittings.

609.7 Installation. Grab bars shall be installed in any manner that provides a gripping surface at the specified locations and that does not obstruct the required clear floor space.

609.8 Structural Strength. Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the grab bar, fastener, mounting device, or supporting structure.

610 Seats

610.2 Bathtub Seats. The top of bathtub seats shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the bathroom finish floor. The depth of a removable in-tub seat shall be 15 inches (380 mm) minimum and 16 inches (405 mm) maximum. The seat shall be capable of secure placement. Permanent seats at the head end of the bathtub shall be 15 inches (380 mm) deep minimum and shall extend from the back wall to or beyond the outer edge of the bathtub.

610.3 Shower Compartment Seats. Where a seat is provided in a standard roll-in shower compartment, it shall be a folding type, shall be installed on the side wall adjacent to the controls, and shall extend from the back wall to a point within 3 inches (75 mm) of the compartment entry. Where a seat is provided in an alternate roll-in type shower compartment, it shall be a folding type, shall be installed on the front wall opposite the back wall, and shall extend from the adjacent side wall to a point within 3 inches (75 mm) of the compartment entry. In transfer-type showers, the seat shall extend from the back wall to a point within 3 inches (75 mm) of the compartment entry. The top of the seat shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the bathroom finish floor. Seats shall comply with 610.3.1 or 610.3.2.

610.3.1 Rectangular Seats. The rear edge of a rectangular seat shall be 2 1/2 inches (64 mm) maximum and the front edge 15 inches (380 mm) minimum and 16 inches (405 mm) maximum from the seat wall. The side edge of the seat shall be 1 1/2 inches (38 mm) maximum from the adjacent wall.

610.3.2 L-Shaped Seats. The rear edge of an L-shaped seat shall be 2 1/2 inches (64 mm) maximum and the front edge 15 inches (380 mm) minimum and 16 inches (405 mm) maximum from the seat wall. The rear edge of the "L" portion of the seat shall be 1 1/2 inches (38 mm) maximum from the wall and the front edge shall be 14 inches (355 mm) minimum and 15 inches (380 mm) maximum from the wall. The end of the "L" shall be 22 inches (560 mm) minimum and 23 inches maximum (585 mm) from the main seat wall.

610.4 Structural Strength. Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the seat, fastener, mounting device, or supporting structure.

CHAPTER 7: COMMUNICATION ELEMENTS AND FEATURES

702 Fire Alarm Systems
702.1 General. Fire alarm systems shall have permanently installed audible and visible alarms complying with NFPA 72 (1999 or 2002 edition) (incorporated by reference, see "Referenced Standards" in Chapter 1), except that the maximum allowable sound level of audible notification appliances complying with section 4-3.2.1 of NFPA 72 (1999 edition) shall have a sound level no more than 110 dB at the minimum hearing distance from the audible appliance. In addition, alarms in guest rooms required to provide communication features shall comply with sections 4-3 and 4-4 of NFPA 72 (1999 edition) or sections 7.4 and 7.5 of NFPA 72 (2002 edition).

703 Signs

703.1 General. Signs shall comply with 703. Where both visual and tactile characters are required, either one sign with both visual and tactile characters, or two separate signs, one with visual, and one with tactile characters, shall be provided.

703.2 Raised Characters. Raised characters shall comply with 703.2 and shall be duplicated in braille complying with 703.3. Raised characters shall be installed in accordance with 703.4.

703.2.1 Depth. Raised characters shall be 1/32 inch (0.8 mm) minimum above their background.

703.2.2 Case. Characters shall be uppercase.

703.2.3 Style. Characters shall be sans serif. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms.

703.2.4 Character Proportions. Characters shall be selected from fonts where the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I". 703.2.5 Character Height. Character height measured vertically from the baseline of the character shall be 5/8 inch (16 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I".

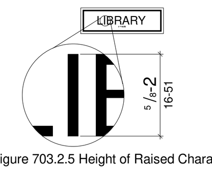


Figure 703.2.5 Height of Raised Characters

703.2.6 Stroke Thickness. Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.

703.2.7 Character Spacing. Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch (1.6 mm) minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch (9.5 mm) minimum.

703.2.8 Line Spacing. Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.

703.3 Braille. Braille shall be contracted (Grade 2) and shall comply with 703.3 and 703.4.
703.3.1 Dimensions and Capitalization. Braille dots shall have a domed or rounded shape and shall comply with Table 703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.

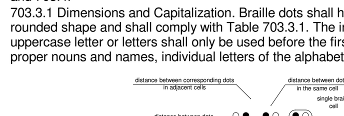


Figure 703.3.1 Braille Measurement

703.3.2 Position. Braille shall be positioned below the corresponding text. If text is multi-lined, braille shall be placed below the entire text. Braille shall be separated 3/8 inch (9.5 mm) minimum from any other tactile characters and 3/8 inch (9.5 mm) minimum from raised borders and decorative elements.

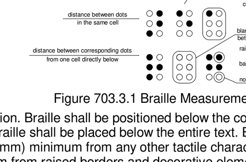


Figure 703.3.2 Position of Braille

703.4 Installation Height and Location. Signs with tactile characters shall comply with 703.4.

703.4.1 Height Above Finish Floor or Ground. Tactile characters on signs shall be located 48 inches (1220 mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches (1525 mm) maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.

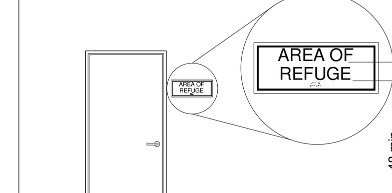


Figure 703.4.1 Height of Tactile Characters Above Finish Floor or Ground

703.4.2 Location. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor space of 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

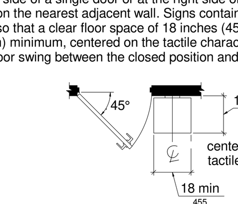


Figure 703.4.2 Location of Tactile Signs at Doors

703.5 Visual Characters. Visual characters shall comply with 703.5.

703.5.1 Finish and Contrast. Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.

703.5.2 Case. Characters shall be uppercase or lowercase or a combination of both.

703.5.3 Style. Characters shall be conventional in form. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms.

703.5.4 Character Proportions. Characters shall be selected from fonts where the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I".

703.5.5 Character Height. Minimum character height shall comply with Table 703.5.5. Viewing distance shall be measured as the horizontal distance between the character and an obstruction preventing further approach towards the sign. Character height shall be based on the uppercase letter "I".

703.5.6 Height From Finish Floor or Ground. Visual characters shall be 40 inches (1015 mm) minimum above the finish floor or ground.

703.5.7 Stroke Thickness. Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 30 percent maximum of the height of the character.

703.5.8 Character Spacing. Character spacing shall be measured between the two closest points of adjacent characters, excluding word spaces. Spacing between individual characters shall be 10 percent minimum and 35 percent maximum of character height.
703.5.9 Line Spacing. Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.

703.6 Pictograms. Pictograms shall comply with 703.6.

703.6.1 Pictogram Field. Pictograms shall have a field height of 6 inches (150 mm) minimum. Characters and braille shall not be located in the pictogram field.

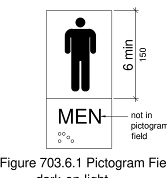


Figure 703.6.1 Pictogram Field
dark-on-light.

703.6.2 Finish and Contrast. Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.

703.6.3 Text Descriptors. Pictograms shall have text descriptors located directly below the pictogram field. Text descriptors shall comply with 703.2, 703.3 and 703.4.

703.7 Symbols of Accessibility. Symbols of accessibility shall comply with 703.7.

703.7.1 Finish and Contrast. Symbols of accessibility and their background shall have a non-glare finish. Symbols of accessibility shall contrast with their background with either a light symbol on a dark background or a dark symbol on a light background.

705 Detectable Warnings

705.1 General. Detectable warnings shall consist of a surface of truncated domes and shall comply with 705.

705.1.1 Dome Size. Truncated domes in a detectable warning surface shall have a base diameter of 0.9 inch (23 mm) minimum and 1.4 inches (36 mm) maximum, a top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and a height of 0.2 inch (5.1 mm).

705.1.2 Dome Spacing. Truncated domes in a detectable warning surface shall have a center-to-center spacing of 1.6 inches (41 mm) minimum and 2.4 inches (61 mm) maximum, and a base-to-base spacing of 0.65 inch (17 mm) minimum, measured between the most adjacent domes on a square grid.

705.1.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light.

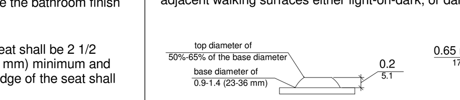


Figure 705.1 Size and Spacing of Truncated Domes

705.2 Platform Edges. Detectable warning surfaces at platform boarding edges shall be 24 inches (610 mm) wide and shall extend the full length of the public use areas of the platform.

706 Assistive Listening Systems

706.2 Receiver Jacks. Receivers required for use with an assistive listening system shall include a 1/8 inch (3.2 mm) standard mono jack.

706.3 Receiver Hearing-Aid Compatibility. Receivers required to be hearing-aid compatible shall interface with telecoils in hearing aids through the provision of neckloops.
706.4 Sound Pressure Level. Assistive listening systems shall be capable of providing a sound pressure level of 110 dB minimum and 118 dB maximum with a dynamic range on the volume control of 50 dB.

706.5 Signal-to-Noise Ratio. The signal-to-noise ratio for internally generated noise in assistive listening systems shall be 18 dB minimum.

706.6 Peak Clipping Level. Peak clipping shall not exceed 18 dB of clipping relative to the peaks of speech.

707 Automatic Teller Machines and Fare Machines

707.2 Clear Floor or Ground Space. A clear floor or ground space complying with 305 shall be provided.

707.3 Operable Parts. Operable parts shall comply with 309. Unless a clear or correct key is provided, each operable part shall be able to be differentiated by sound or touch, without activation.

EXCEPTION: Drive-up only automatic teller machines and fare machines shall not be required to comply with 309.2 and 309.3.

707.4 Privacy. Automatic teller machines shall provide the opportunity for the same degree of privacy of input and output available to all individuals.

707.5 Speech Output. Machines shall be speech enabled. Operating instructions and orientation, visible transaction prompts, user input verification, error messages, and all displayed information for full use shall be accessible to and independently usable by individuals with vision impairments. Speech shall be delivered through a mechanism that is readily available to all users, including but not limited to, an industry standard connector or a telephone handset. Speech shall be recorded or digitized human, or synthesized.

707.5.1 User Control. Speech shall be capable of being repeated or interrupted. Volume control shall be provided for the speech function.

707.5.2 Receipts. Where receipts are provided, speech output devices shall provide audible balance inquiry information, error messages, and all other information on the printed receipt necessary to complete or verify the transaction.
707.6 Input. Input devices shall comply with 707.6.

707.6.1 Input Controls. At least one tactilely discernible input control shall be provided for each function. Where provided, key surfaces not on active areas of display screens, shall be raised above surrounding surfaces. Where membrane keys are the only method of input, each shall be tactilely discernable from surrounding surfaces and adjacent keys.

707.6.2 Numeric Keys. Numeric keys shall be arranged in a 12-key ascending or descending telephone keypad layout. The number five key shall be tactilely distinct from the other keys.

707.6.3.1 Contrast. Function keys shall contrast visually from background surfaces. Characters and symbols on key surfaces shall contrast visually from key surfaces. Visual contrast shall be either light-on-dark or dark-on-light.

707.6.3.2 Tactile Symbols. Function key surfaces shall have tactile symbols as follows: Enter or Proceed key: raised circle; Clear or Correct key: raised left arrow; Cancel key: raised letter ex; Add Value key: raised plus sign; Decrease Value key: raised minus sign.

707.7 Display Screen. The display screen shall comply with 707.7.

707.7.1 Visibility. The display screen shall be visible from a point located 40 inches (1015 mm) above the center of the clear floor space in front of the machine.

707.7.2 Characters. Characters displayed on the screen shall be in a sans serif font. Characters shall be 3/16 inch (4.8 mm) high minimum based on the uppercase letter "I". Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.

707.8 Braille Instructions. Braille instructions for initiating the speech mode shall be provided. Braille shall comply with 703.3.

708 Two-Way Communication Systems

708.1 General. Two-way communication systems shall comply with 708.
708.2 Audible and Visual Indicators. The system shall provide both audible and visual signals.

708.3 Handsets. Handset cords, if provided, shall be 29 inches (735 mm) long minimum.

708.4 Residential Dwelling Unit Communication Systems. Communications systems between a residential dwelling unit and a site, building, or floor entrance shall comply with 708.4.

708.4.1 Common Use or Public Use System Interface. The common use or public use system interface shall include the capability of supporting voice and TTY communication with the residential dwelling unit interface.

CHAPTER 8: SPECIAL ROOMS, SPACES AND ELEMENTS
801 General

801.1 Scope. The provisions of Chapter 8 shall apply where required by Chapter 2 or where referenced by a requirement in this document.

Advisory 801.1 Scope. Facilities covered by these requirements are also subject to the requirements of the other chapters. For example, 806 addresses guest rooms in transient lodging facilities while 902 contains the technical specifications for dining surfaces. If a transient lodging facility contains a restaurant, the restaurant must comply with requirements in other chapters such as those applicable to certain dining surfaces.

802 Wheelchair Spaces, Companion Seats, and Designated Aisle Seats

802.1 Wheelchair Spaces. Wheelchair spaces shall comply with 802.1.

802.1.1 Floor or Ground Surface. The floor or ground surface of wheelchair spaces shall comply with 302. Changes in level are not permitted.

EXCEPTION: Slopes not steeper than 1:48 shall be permitted.

802.1.2 Width. A single wheelchair space shall be 36 inches (915 mm) wide minimum Where two adjacent wheelchair spaces are provided, each wheelchair space shall be 33 inches (840 mm) wide minimum.

802.1.3 Depth. Where a wheelchair space can be entered from the front or rear, the wheelchair space shall be 48 inches (1220 mm) deep minimum. Where a wheelchair space can be entered only from the side, the wheelchair space shall be 60 inches (1525 mm) deep minimum.

802.1.4 Approach. Wheelchair spaces shall adjoin accessible routes. Accessible routes shall not overlap wheelchair spaces.

Advisory 802.1.4 Approach. Because accessible routes serving wheelchair spaces are not permitted to overlap the clear floor space at wheelchair spaces, access to any wheelchair space cannot be through another wheelchair space.

802.1.5 Overlap. Wheelchair spaces shall not overlap circulation paths.
Advisory 802.1.5 Overlap. The term "circulation paths" used in Section 802.1.5 means aisle width required by applicable building or life safety codes for the specific assembly occupancy. Where the circulation path provided is wider than the required aisle width, the wheelchair space may intrude into that portion of the circulation path that is provided in excess of the required aisle width.

802.2 Lines of Sight. Lines of sight to the screen, performance area, or playing field for spectators in wheelchair spaces shall comply with 802.2.

802.2.1 Lines of Sight Over Seated Spectators. Where spectators are expected to remain seated during events, spectators in wheelchair spaces shall be afforded lines of sight complying with 802.2.1.

802.2.1.1 Lines of Sight Over Heads. Where spectators are provided lines of sight over the heads of spectators seated in the first row in front of their seats, spectators seated in wheelchair spaces shall be afforded lines of sight over the heads of seated spectators in the first row in front of wheelchair spaces.

802.2.1.2 Lines of Sight Between Heads. Where spectators are provided lines of sight over the shoulders and between the heads of spectators seated in the first row in front of their seats, spectators seated in wheelchair spaces shall be afforded lines of sight over the shoulders and between the heads of seated spectators in the first row in front of wheelchair spaces.

802.2.2 Lines of Sight Over Standing Spectators. Where spectators are expected to stand during events, spectators in wheelchair spaces shall be afforded lines of sight complying with 802.2.2.

802.2.2.1 Lines of Sight Over Heads. Where standing spectators are provided lines of sight over the heads of spectators standing in the first row in front of their seats, spectators seated in wheelchair spaces shall be afforded lines of sight over the heads of standing spectators in the first row in front of wheelchair spaces.

802.2.2.2 Lines of Sight Between Heads. Where standing spectators are provided lines of sight over the shoulders and between the heads of spectators standing in the first row in front of their seats, spectators seated in wheelchair spaces shall be afforded lines of sight over the shoulders and between the heads of standing spectators in the first row in front of wheelchair spaces.

802.3 Companion Seats. Companion seats shall comply with 802.3.

802.3.1 Alignment. In row seating, companion seats shall be located to provide shoulder alignment with adjacent wheelchair spaces. The shoulder alignment point of the wheelchair space shall be measured 36 inches (915 mm) from the front of the wheelchair space. The floor surface of the companion seat shall be at the same elevation as the floor surface of the wheelchair space.

802.3.2 Type. Companion seats shall be equivalent in size, quality, comfort, and amenities to the seating in the immediate area. Companion seats shall be permitted to be movable.

802.4 Designated Aisle Seats. Designated aisle seats shall comply with 802.4.

802.4.1 Armrests. Where armrests are provided on the seating in the immediate area, folding or retractable armrests shall be provided on the aisle side of the seat.
802.4.2 Identification. Each designated aisle seat shall be identified by a sign or marker.

Advisory 802.4.2 Identification. Seats with folding or retractable armrests are intended for use by individuals who have difficulty walking. Consider identifying such seats with signs that contrast (light-on-dark or dark-on-light) and that are also photo luminescent.

804 Kitchens and Kitchenettes
804.1 General. Kitchens and kitchenettes shall comply with 804.

804.2 Clearance. Where a pass through kitchen is provided, clearances shall comply with 804.2.1. Where a U-shaped kitchen is provided, clearances shall comply with 804.2.2.

EXCEPTION: Spaces that do not provide a cooktop or conventional range shall not be required to comply with 804.2.

Advisory 804.2 Clearance. Clearances are measured from the furthest projecting face of all opposing base cabinets, counter tops, appliances, or walls, excluding hardware.

804.2.1 Pass Through Kitchen. In pass through kitchens where counters, appliances or cabinets are on two opposing sides, or where counters, appliances or cabinets are opposite a parallel wall, clearance between all opposing base cabinets, counter tops, appliances, or walls within kitchen work areas shall be 40 inches (1015 mm) minimum. Pass through kitchens shall have two entries.
804.2.2 U-Shaped. In U-shaped kitchens enclosed on three contiguous sides, clearance between all opposing base cabinets, counter tops, appliances, or walls within kitchen work areas shall be 60 inches (1525 mm) minimum.

804.3 Kitchen Work Surface. In residential dwelling units required to comply with 809, at least one 30 inches (760 mm) wide minimum section of counter shall provide a kitchen work surface that complies with 804.3.

804.3.1 Clear Floor or Ground Space. A clear floor space complying with 305 positioned for a forward approach shall be provided. The clear floor or ground space shall be centered on the kitchen work surface and shall provide knee and toe clearance complying with 306.

EXCEPTION: Cabinetry shall be permitted under the kitchen work surface provided that all of the following conditions are met:

(a) the cabinetry can be removed without removal or replacement of the kitchen work surface; (b) the finish floor extends under the cabinetry; and

(c) the walls behind and surrounding the cabinetry are finished.

804.3.2 Height. The kitchen work surface shall be 34 inches (865 mm) maximum above the finish floor or ground.

EXCEPTION: A counter that is adjustable to provide a kitchen work surface at variable heights, 29 inches (735 mm) minimum and 36 inches (915 mm) maximum, shall be permitted.

804.3.3 Exposed Surfaces. There shall be no sharp or abrasive surfaces under the work surface counters.

804.4 Sinks. Sinks shall comply with 606.

804.5 Storage. At least 50 percent of shelf space in storage facilities shall comply with 811.

804.6 Appliances. Where provided, kitchen appliances shall comply with 804.6.

804.6.1 Clear Floor or Ground Space. A clear floor or ground space complying with 305 shall be provided at each kitchen appliance. Clear floor or ground spaces shall be permitted to overlap.

804.6.2 Operable Parts. All appliance controls shall comply with 309.

EXCEPTIONS:
1. Appliance doors and door latching devices shall not be required to comply with 309.4.
2. Bottom-hinged appliance doors, when in the open position, shall not be required to comply with 309.3.

804.6.3 Dishwasher. Clear floor or ground space shall be positioned adjacent to the dishwasher door. The dishwasher door, in the open position, shall not obstruct the clear floor or ground space for the dishwasher or the sink.

804.6.4 Range or Cooktop. Where a forward approach is provided, the clear floor or ground space shall provide knee and toe clearance complying with 306. Where knee and toe space is provided, the underside of the range or cooktop shall be insulated or otherwise configured to prevent burns, abrasions, or electrical shock. The location of controls shall not require reaching across burners.

804.6.5 Oven. Ovens shall comply with 804.6.5.

804.6.5.1 Side-Hinged Door Ovens. Side-hinged door ovens shall have the work surface required by 804.3 positioned adjacent to the latch side of the oven door.
804.6.5.2 Bottom-Hinged Door Ovens. Bottom-hinged door ovens shall have the work surface required by 804.3 positioned adjacent to one side of the door.

804.6.5.3 Controls. Ovens shall have controls on front panels.
804.6.6 Refrigerator/Freezer. Combination refrigerators and freezers shall have at least 50 percent of the freezer space 54 inches (1370 mm) maximum above the finish floor or ground. The clear floor or ground space shall be positioned for a parallel approach to the space dedicated to a refrigerator/freezer with the centerline of the clear floor or ground space offset 24 inches (610 mm) maximum from the centerline of the dedicated space.

811 Storage
811.1 General. Storage shall comply with 811.

811.2 Clear Floor or Ground Space. A clear floor or ground space complying with 305 shall be provided.

811.3 Height. Storage elements shall comply with at least one of the reach ranges specified in 308.

811.4 Operable Parts. Operable parts shall comply with 309.

CHAPTER 9: BUILT-IN ELEMENTS

902 Dining Surfaces and Work Surfaces
902.2 Clear Floor or Ground Space. A clear floor space complying with 305 positioned for a forward approach shall be provided. Knee and toe clearance complying with 306 shall be provided.

902.3 Height. The tops of dining surfaces and work surfaces shall be 28 inches (710 mm) minimum and 34 inches (865 mm) maximum above the finish floor or ground.
902.4 Dining Surfaces and Work Surfaces for Children's Use. Accessible dining surfaces and work surfaces for children's use shall comply with 902.4.

902.4.1 Clear Floor or Ground Space. A clear floor space complying with 305 positioned for forward approach shall be provided. Knee and toe clearance complying with 306 shall be provided, except that knee clearance 24 inches (610 mm) minimum above the finish floor or ground shall be permitted.

902.4.2 Height. The tops of tables and counters shall be 26 inches (660 mm) minimum and 30 inches (760 mm) maximum above the finish floor or ground.

903 Benches
903.2 Clear Floor or Ground Space. Clear floor or ground space complying with 305 shall be provided and shall be positioned at the end of the bench seat and parallel to the short axis of the bench.

903.3 Size. Benches shall have seats that are 42 inches (1065 mm) long minimum and 20 inches (510 mm) deep minimum and 24 inches (610 mm) deep maximum.
903.4 Back Support. The bench shall provide for back support or shall be affixed to a wall. Back support shall be 42 inches (1065 mm) long minimum and shall extend from a point 2 inches (51 mm) maximum above the seat surface to a point 18 inches (455 mm) minimum above the seat surface. Back support shall be 2 1/2 inches (64 mm) maximum from the rear edge of the seat measured horizontally.

903.5 Height. The top of the bench seat surface shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the finish floor or ground.

903.6 Structural Strength. Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the seat, fastener, mounting device, or supporting structure.

903.7 Wet Locations. Where installed in wet locations, the surface of the seat shall be slip resistant and shall not accumulate water.

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

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Ownership of Instruments of Service:
All reports, plans, specifications, computer files, field data, notes & other documents and instruments prepared by BRAVE / ARCHITECTURE as instruments of service shall remain the property of BRAVE / ARCHITECTURE. BRAVE / ARCHITECTURE shall retain all common law, statutory and other reserved rights, including the copyright thereto.

SEAL:

DOCUMENT IS HEREBY INCLUDED AS REFERENCE ONLY

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

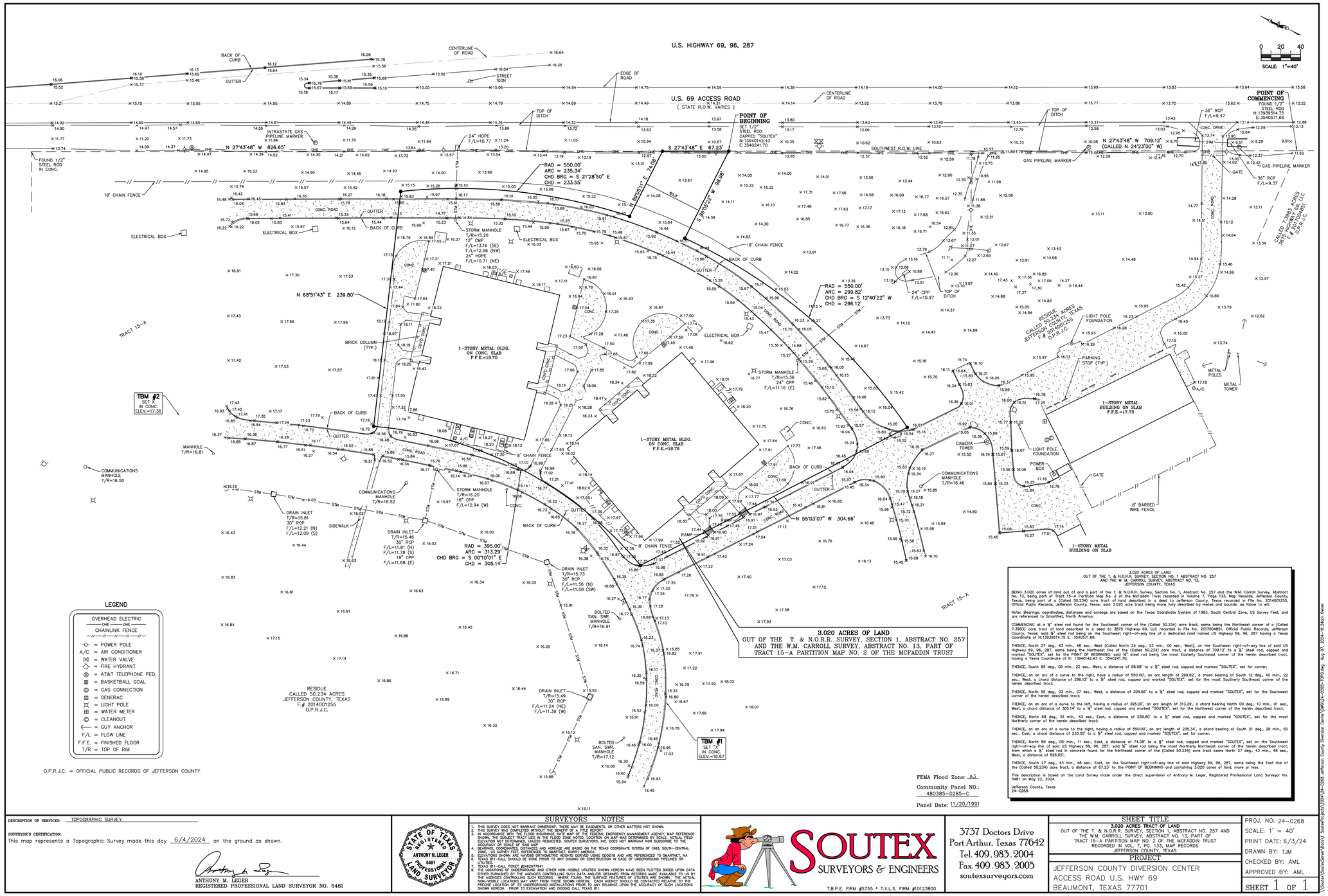
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

TEXAS ACCESSIBILITY GUIDELINES

Scale: AS NOTED

G.020



LEGEND

- OHE — OVERHEAD ELECTRIC
- CHAINLINK FENCE
- POWER POLE
- A/C = AIR CONDITIONER
- WATER VALVE
- FIRE HYDRANT
- A = AT&T TELEPHONE PED.
- BASKETBALL GOAL
- G = GAS CONNECTION
- GENERAC
- LIGHT POLE
- W = WATER METER
- C = CLEANOUT
- GUY ANCHOR
- F/L = FLOW LINE
- F.F.E. = FINISHED FLOOR
- T/R = TOP OF RIM

O.P.R.J.C. = OFFICIAL PUBLIC RECORDS OF JEFFERSON COUNTY

FEMA Flood Zone: A3

Community Panel NO.: 480385-0285-C

Panel Date: 11/20/1991

3.020 ACRES OF LAND
OUT OF THE T. & N.O.R.R. SURVEY, SECTION NO. 1 ABSTRACT NO. 257
AND THE W. M. CARROLL SURVEY, ABSTRACT NO. 13,
JEFFERSON COUNTY, TEXAS

BEING 3.020 acres of land out of and a part of the T. & N.O.R.R. Survey, Section No. 1, Abstract No. 257 and the W.M. Carroll Survey, Abstract No. 13, being part of Tract 15-A Partition Map No. 2 of the McFaddin Trust recorded in Volume 7, Page 133, Map Records, Jefferson County, Texas, being part of a (Called 50.234) acre tract of land described in a deed to Jefferson County, Texas recorded in File No. 2014001255, Official Public Records, Jefferson County, Texas, said 3.020 acre tract being more fully described by metes and bounds, as follow to wit:

Note: Bearings, coordinates, distances and acreage are based on the Texas Coordinate System of 1983, South Central Zone, US Survey Feet, and are referenced to Smartnet, North America.

COMMENCING at a ½" steel rod found for the Southeast corner of the (Called 50.234) acre tract, same being the Northeast corner of a (Called 7.3983) acre tract of land described in a deed to 3875 Highway 69, LLC recorded in File No. 2017004851, Official Public Records, Jefferson County, Texas; said ½" steel rod being on the Southwest right-of-way line of a dedicated road named US Highway 69, 96, 287 having a Texas Coordinate of N:13939514.75 E: 3540571.66;

THENCE, North 27 deg, 43 min, 48 sec, West (Called North 24 deg., 23 min., 00 sec., West), on the Southeast right-of-way line of said US Highway 69, 96, 287, same being the Northeast line of the (Called 50.234) acre tract, a distance of 709.12' to a ½" steel rod, capped and marked "SOUTEX", set for the POINT OF BEGINNING; said ½" steel rod being the most Easterly Southeast corner of the herein described tract, having a Texas Coordinate of N: 13940142.43 E: 3540241.70;

THENCE, South 89 deg., 05 min., 22 sec., West, a distance of 98.98' to a ½" steel rod, capped and marked "SOUTEX", set for corner;

THENCE, on an arc of a curve to the right, have a radius of 550.00', an arc length of 299.82', a chord bearing of South 12 deg, 40 min., 22 sec., West, a chord distance of 296.12' to a ½" steel rod, capped and marked "SOUTEX", set for the most Southerly Southeast corner of the herein described tract;

THENCE, North 55 deg., 03 min., 07 sec., West, a distance of 304.66' to a ½" steel rod, capped and marked "SOUTEX", set for the Southwest corner of the herein described tract;

THENCE, on an arc of a curve to the left, having a radius of 395.00', an arc length of 313.29', a chord bearing North 00 deg., 10 min., 01 sec., West, a chord distance of 305.14' to a ½" steel rod, capped and marked "SOUTEX", set for the Northwest corner of the herein described tract;

THENCE, North 68 deg., 51 min., 43 sec., East, a distance of 239.80' to a ½" steel rod, capped and marked "SOUTEX", set for the most Northerly corner of the herein described tract;

THENCE, on an arc of a curve to the right, having a radius of 550.00', an arc length of 235.34', a chord bearing of South 21 deg., 28 min., 50 sec., East, a chord distance of 233.55' to a ½" steel rod, capped and marked "SOUTEX", set for corner;

THENCE, North 89 deg., 05 min., 11 sec., East, a distance of 74.08' to a ½" steel rod, capped and marked "SOUTEX", set on the Southwest right-of-way line of said US Highway 69, 96, 287; said ½" steel rod being the most Northerly Northeast corner of the herein described tract; from which a ½" steel rod in concrete found for the Northeast corner of the (Called 50.234) acre tract bears North 27 deg., 43 min., 48 sec., West, a distance of 826.65';

THENCE, South 27 deg., 43 min., 48 sec., East, on the Southwest right-of-way line of said Highway 69, 96, 287, same being the East line of the (Called 50.234) acre tract, a distance of 67.23' to the POINT OF BEGINNING and containing 3.020 acres of land, more or less.

This description is based on the Land Survey made under the direct supervision of Anthony M. Leger, Registered Professional Land Surveyor No. 5481 on May 22, 2024.

Jefferson County, Texas
24-0268

DESCRIPTION OF SERVICES: TOPOGRAPHIC SURVEY

SURVEYOR'S CERTIFICATION:
This map represents a Topographic Survey made this day 6/4/2024 on the ground as shown.

ANTHONY M. LEGER
REGISTERED PROFESSIONAL LAND SURVEYOR NO. 5481

STATE OF TEXAS REGISTERED ANTHONY M. LEGER 5481 PROFESSIONAL LAND SURVEYOR

SURVEYORS NOTES

1. THIS SURVEY DOES NOT WARRANT OWNERSHIP, THERE MAY BE EASEMENTS, OR OTHER MATTERS NOT SHOWN.
2. THIS TRACT IS NOT IN A FLOOD HAZARD AREA.
3. IN ACCORDANCE WITH THE FLOOD INSURANCE RATE MAP OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY, MAP REFERENCE SHOWN, THE SUBJECT TRACT LIES IN THE FLOOD ZONE NOTED. LOCATION ON MAP WAS DETERMINED BY SCALE. ACTUAL FIELD ELEVATION NOT DETERMINED, UNLESS REQUESTED. SOUTEX SURVEYORS, INC. DOES NOT WARRANT NOR SUBSCRIBE TO THE ACCURACY OR SCALE OF SAID MAP.
4. BEARINGS, COORDINATES, DISTANCES AND ACREAGE ARE BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH-CENTRAL ZONE, US SURVEY FEET, REFERENCED TO SMARTNET, NORTH AMERICA.
5. ELEVATIONS SHOWN ARE NAVD88 ORTHOMETRIC HEIGHTS DERIVED USING GEOID18 AND ARE REFERENCED TO SMARTNET, NA
6. TEXAS 811-CALL SHOULD BE DONE PRIOR TO ANY DIGGING OR CONSTRUCTION IN CASE OF UNDERGROUND PIPELINES OR UTILITIES.
7. TEXAS 811-CALL TICKET #246297941
8. THE LOCATIONS OF UNDERGROUND AND OTHER NON-VISIBLE UTILITIES SHOWN HEREON HAVE BEEN PLOTTED BASED UPON DATA EITHER FURNISHED BY THE AGENCIES CONTROLLING SUCH DATA AND/OR OBTAINED FROM RECORDS MADE AVAILABLE TO US BY THE AGENCIES CONTROLLING SUCH RECORDS. WHERE FOUND, THE SURFACE FEATURES OF UTILITIES ARE SHOWN. THE ACTUAL NON-VISIBLE LOCATIONS MAY VARY FROM THOSE SHOWN HEREON. EACH AGENCY SHOULD BE CONTACTED RELATIVE TO THE PRECISE LOCATION OF ITS UNDERGROUND INSTALLATIONS PRIOR TO ANY RELIANCE UPON THE ACCURACY OF SUCH LOCATIONS SHOWN HEREON. PRIOR TO EXCAVATION AND DIGGING CALL TEXAS 811.

SOUTEX SURVEYORS & ENGINEERS
T.B.P.E. FIRM #5755 • T.X.L.S. FIRM #10123800

3737 Doctors Drive
Port Arthur, Texas 77642
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soutexsurveyors.com

SHEET TITLE
3.020 ACRES TRACT OF LAND
OUT OF THE T. & N.O.R.R. SURVEY, SECTION 1, ABSTRACT NO. 257 AND THE W.M. CARROLL SURVEY, ABSTRACT NO. 13, PART OF TRACT 15-A PARTITION MAP NO. 2 OF THE MCFADDIN TRUST RECORDED IN VOL. 7, PG. 133, MAP RECORDS JEFFERSON COUNTY, TEXAS

PROJECT
JEFFERSON COUNTY DIVERSION CENTER
ACCESS ROAD U.S. HWY 69
BEAUMONT, TEXAS 77701

PROJ. NO: 24-0268
SCALE: 1' = 40'
PRINT DATE: 6/3/24
DRAWN BY: TJM
CHECKED BY: AML
APPROVED BY: AML
SHEET 1 OF 1

JC DIVERSION CENTER RENOVATION

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09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

SITE SURVEY

Scale: AS NOTED

G.030

C:\Users\JTaylor\Documents\DallyLY_SocketPlace-24_V2020_LM-22668_Jefferson County Diversion Center_WMVJ.rvt - Aug 07, 2024 10:32 AM - Taylor

INTERIOR ELEVATION GENERAL NOTES (20)

IE1. Refer to general information sheets for typical graphic, symbols, abbreviation index, and "Master Keynote" list.

IE2. Refer to Texas Accessibility Guidelines sheet(s).

IE3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

IE4. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted. Items are required to resist 250 pound point load.

IE5. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural elevations. Contractor to coordinate and mount all MEP items per architectural sheet A.730 unless noted otherwise.

IE6. Refer to finish schedule and plans for all finishes unless noted otherwise.

IE7. All custom millwork, if in scope of work, is shown in elevation and designed per designated details. Refer to interior elevations, millwork details, and related specifications divisions for additional information. Contractor to field verify all dimensions. Re: A.153 for finish schedule.

IE8. All manufactured casework, if in scope of work, is designated on enlarged floor plans. Refer to casework schedule and related specifications divisions for detailed information. Contractor is to follow the scheduled manufacturer's specifications, instructions, and recommendations unless directed otherwise by the contract manual.

IE9. Refer to the equipment schedule for all installed equipment. Equipment is designed on enlarged floor plans.

IE10. Receptacles mounted above countertops/backsplashes are to be 42" AFF to centerline of coverplate and are to be installed horizontally, unless noted otherwise

WALL SECTION GENERAL NOTES (19)

WS1. Refer to general information sheets for typical graphic, symbols, abbreviation index, and "Master Keynote" list.

WS2. Refer to Texas Accessibility Guidelines sheet(s).

WS3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

WS4. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted. Items are required to resist 250 pound point load.

WS5. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural elevations. Contractor to coordinate and mount all MEP items per architectural sheet A.730 unless noted otherwise.

WS6. Refer to finish schedule and plans for all finishes unless noted otherwise.

WS7. All custom millwork, if in scope of work, is shown in elevation and designed per designated details. Refer to interior elevations, millwork details, and related specifications divisions for additional information.

WS8. All manufacturer casework, if in scope of work, is designated on enlarged floor plans. Refer to casework schedule and related specifications division for detailed information. Contractor is to follow the scheduled manufacturer's specifications, instructions, and recommendations unless directed otherwise by the contract manual.

WS9. Refer to the equipment schedule for all installed equipment. Equipment is designed on enlarged floor plans.

FINISH FLOOR PLAN GENERAL NOTES (18)

FN1. Refer to General sheets for typical graphic, symbols, abbreviation index, and "Master Keynote" list.

FN2. Refer to Texas Accessibility Guidelines Sheet(s)

FN3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

FN4. Overall plan indicates exterior building dimensions, room numbers and names, door designations, window designations, exterior elevations designations, exterior plan designations, sign designations, and building section designations. All other plan information is indicated on referenced enlarged plans.

FN5. Enlarged plans indicate interior building dimensions to face of partition material, interior plan detail designations, interior elevation designations, partition type designations, finish designations, and general building material.

FN6. All dimensions are to be tied to a column line. Contractor will immediately report any omission of dimensions not tied to a column line to the Architect prior to start of construction.

FN7. Coordinate all MEP access panels not shown on architectural construction documents with Architect prior to installation.

FN8. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted.

FN9. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural plans. Contractor to coordinate and mount all MEP items per Architectural sheet A.730 unless noted otherwise.

FN10. All equipment / areas labeled "ADA" are to be accessible, Refer to Texas Accessibility Guidelines sheet(s) and Standard Mounting Locations & Toilet Room Configuration.

FN11. Provide moisture resistant finish as designated and as required in specifications.

FN12. Provide non-slip surface finish in wet areas.

FN13. Exposed interior structural steel to be exterior grade paint finish.

FN14. Provide finishes as scheduled or selected by architect.

FN15. All electronic cut vinyl graphics to be installed on Level 5 gypsum wall finish. Use high-tack adhesive for all vinyl graphics. GC to verify final wall graphic and font with Architect prior to purchase & installation.

PARTITION GENERAL NOTES (17)

P1. Refer to index sheet G.001 for typical graphical symbols and abbreviation index.

P2. Refer to sheet G.020 for accessibility guidelines.

P3. All partitions in wet or moist locations will receive moisture resistant sheathing. Refer to plans and specifications for locations of wet or moist areas and material required.

P4. Refer to the enlarged floor plans for the locations of the partitions unless noted otherwise.

P5. Refer to this sheet for standard details pertaining to the partitions types. One or more of the details will pertain to each partition. It is the responsibility of the contractor to coordinate and reference all standard details to each partition. The contractor is to immediately contact the Architect if any questions arise.

P6. Refer to door schedules, window types, and details for construction of openings in the partitions.

P7. For all smoke and/or fire rated partitions the designated UL design is to be maintained without exception. All penetrations and openings are to be sealed with an approved UL design or designated detail. These drawings do not list all the UL designs necessary to maintain a partition's smoke and/or fire rating. It is the responsibility of the General Contractor to ensure all rated partitions fully meet UL requirements.

P8. Adequate fire retardant blocking is required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc. are to be mounted. Blocking is in addition to noted partition construction, and is not meant to replace the partition construction. Blocking is not to interfere or degrade a partition's smoke and/or fire rating.

P9. Provide corner guard at every corner of exposed gypsum wall board assembly, Re: Finish Plan.

P.10 Refer to 2/A.630 for drywall partition design limitations.

P.11 Refer to Finish Plans and Schedules, Interior and Exterior Elevations, Sections and Details for wall finishes.

WALL SECTION GENERAL NOTES (16)

WS1. Refer to General sheets for typical graphic, symbols, abbreviation index, and "Master Keynote" list.

WS2. Refer to Texas Accessibility Guidelines sheet(s).

WS3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

WS4. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted. Items are required to resist 250 pound point load.

WS5. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural elevations. Contractor to coordinate and mount all MEP items per architectural sheet A.730 unless noted otherwise.

WS6. Refer to finish schedule and plans for all finishes unless noted otherwise.

WS7. All custom millwork, if in scope of work, is shown in elevation and designed per designated details. Refer to interior elevations, millwork details, and specifications divisions 06000 and/or division 12000.

WS8. All manufacturer casework, if in scope of work, is designated on enlarged floor plans. Refer to casework schedule and specifications division 12000 for detailed information. Contractor is to follow the scheduled manufacturer's specifications, instructions, and recommendations unless directed otherwise by the contract manual.

WS9. Refer to the equipment schedule for all installed equipment. Equipment is designed on enlarged floor plans.

R.C.P. GENERAL NOTES (15)

RP1. Refer to general information sheets for typical graphic symbols, abbreviation index, and "Master Keynote" list.

RP2. Refer to interior elevations for furred down heights U.N.O.

RP3. Center lay-in acoustical ceiling system in each room with equal tile dimensions on opposite walls unless otherwise noted. Notify architect if any tile abutting the partition is less than 6" in width. Secondary wall angles to support "short" runs will not be accepted.

RP4. In lay-in acoustical ceilings locate all HVAC items, emergency lighting, sprinkler heads, etc in center of tile unless otherwise noted.

RP5. In gypsum board ceilings locate all HVAC items, emergency lighting, sprinkler heads in center of space and equal distant apart from each other unless otherwise noted.

RP6. Coordinate all MEP ceiling and access panels not shown on the architectural construction documents with architect prior to installation.

RP7. In exposed ceilings evenly space all fixtures at or below exposed structure or MEP ductwork. Coordinate with MEP to provide lighting "around" final MEP layout to avoid "dark" spots.

RP8. For concealed type sprinkler heads, Architect will coordinate w/owner finish of shield (E.G. White, ETC.) typical head finish to match adjacent surface color.

FLOOR PLAN GENERAL NOTES (14)

FP1. Refer to general information sheets for typical graphical symbols, abbreviation index, and "Master Keynote" list.

FP2. Refer to general notes for accessibility guidelines.

FP3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

FP4. Overall plan indicates exterior building dimensions, room numbers and names, door designations, window designations, exterior elevations designations, exterior plan designations, sign designations, and building section designations. All other plan information is indicated on referenced enlarged plans.

FP5. Plans indicate interior and exterior building dimensions shown face of stud to face of stud, interior plan detail designations, interior elevation designations, partition type designations, finish designations, and general building material. General contractor to coordinate additional requirements of interior and exterior wall finishes and components.

FP6. All dimensions are to be tied to a column line. Contractor will immediately report any omission of dimensions not tied to a column line to the Architect prior to start of construction.

FP7. Coordinate all MEP access panels not shown on architectural construction documents with Architect prior to installation.

FP8. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted.

FP9. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural plans. Contractor to coordinate and mount all MEP items per Architectural sheet A.730 unless noted otherwise.

FP10. All wood blocking to be Fire Resistant

EXTERIOR ELEVATION GENERAL NOTES (13)

E1. Refer to general information sheets for typical graphical symbols, and abbreviation index, and "Master Keynote" list.

E2. Refer to sheet G.030 for accessibility guidelines.

E3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

E4. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted. Item are required to resist 250 pound point load.

E5. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural elevations. Contractor to coordinate and mount all MEP items per architectural sheet A.730 unless noted otherwise.

E6. Refer to finish schedule and plans for all finishes unless noted otherwise.

E7. All custom millwork, if in scope of work, is shown in elevation and designed per designated details. Refer to interior elevations, millwork details, and related specifications divisions.

E8. All manufacturer casework, if in scope of work, is designated on enlarged floor plans. Refer to casework schedule and related specifications divisions for detailed information. Contractor is to follow the scheduled manufacturer's specifications, instructions, and recommendations unless directed otherwise by the contract manual.

E9. Refer to the equipment schedule for all installed equipment. Equipment is designed on enlarged floor plans.

E10. Refer to partition types, finish schedule, signage schedule, door and hardware schedule, and window types for additional information.

BUILDING SECTION GENERAL NOTES (12)

BS1. Refer to General sheets for typical graphic, symbols, abbreviation index, and "Master Keynote" list.

BS2. Refer to Texas Accessibility Guidelines sheet(s).

BS3. All horizontal dimensions are provided on plans, and all vertical dimensions are provided on elevations and/or sections unless otherwise noted.

BS4. Provide adequate blocking as required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc., are to be mounted. Items are required to resist 250 pound point load.

BS5. There are items shown, i.e. outlets, switches, thermostats, on the MEP drawings that are not drawn on the architectural elevations. Contractor to coordinate and mount all MEP items per architectural sheet A.730 unless noted otherwise.

BS6. Refer to finish schedule and plans for all finishes unless noted otherwise.

BS7. All custom millwork, if in scope of work, is shown in elevation and designed per designated details. Refer to interior elevations, millwork details, and related specifications divisions for additional information.

BS8. All manufacturer casework, if in scope of work, is designated on enlarged floor plans. Refer to casework schedule and related specifications divisions for detailed information. Contractor is to follow the scheduled manufacturer's specifications, instructions, and recommendations unless directed otherwise by the contract manual.

BS9. Refer to the equipment schedule for all installed equipment. Equipment is designed on enlarged floor plans.

BS10. Floor and roof framing shown in Architectural drawings are for reference only; Re: structural

SITE PLAN GENERAL NOTES (11)

SP1. Refer general sheets for typical graphical symbols, abbreviation index and "Master Keynote" list.

SP2. Civil Documents take precedence over all Architectural Documents unless noted otherwise on Civil.

SP3. The Building must be tied to the property line in two directions, and Contractor to notify Architect before start of work if there are any omissions to this requirement in the drawing. Contractor to start building construction @ designated "Start Point" unless otherwise noted.

SP4. All types of perimeter fencing to be erected on property line.

SP5. Refer to civil drawings for additional site information and details

ROOF PLAN GENERAL NOTES (10)

R1. Internal Gutters to have Stainless Steel Gutter liner and a liquid-applied reinforced PMMA waterproofing membrane inside the gutter to prevent leaking.

R2. Reference MEP for roof top unit locations.

CONSTRUCTION DRAWING GENERAL NOTES (9)

1. REFERENCE THESE NOTES FOR ALL GENERAL NOTES SECTIONS.
2. REFER TO GENERAL INFORMATION SHEETS FOR TYPICAL GRAPHIC, SYMBOLS, ABBREVIATION INDEX, AND "MASTER KEYNOTE" LIST.
3. REFER TO TEXAS ACCESSIBILITY GUIDELINES SHEET(S).
4. REFER TO STANDARD MOUNTING LOCATIONS & TOILET ROOM CONFIGURATIONS SHEET(S) FOR STANDARD DETAILS AND MOUNTING HEIGHTS.
5. ALL HORIZONTAL DIMENSIONS ARE PROVIDED ON PLANS, AND ALL VERTICAL DIMENSIONS ARE PROVIDED ON ELEVATIONS AND/OR SECTIONS UNLESS OTHERWISE NOTED. ALL HORIZONTAL DIMENSIONS ARE TO BE TIED TO A COLUMN LINE. CONTRACTOR WILL IMMEDIATELY REPORT ANY OMISSION OF DIMENSIONS NOT TIED TO A COLUMN LINE TO THE ARCHITECT PRIOR TO START OF CONSTRUCTION.
6. OVERALL PLAN INDICATES EXTERIOR BUILDING DIMENSIONS, ROOM NUMBERS AND NAMES, DOOR DESIGNATIONS, WINDOW DESIGNATIONS, EXTERIOR ELEVATION DESIGNATIONS, ENLARGED PLAN DESIGNATIONS, PARTITION DESIGNATIONS, SIGN DESIGNATIONS, AND BUILDING SECTION DESIGNATIONS. ALL OTHER PLAN INFORMATION IS INDICATED ON REFERENCED ENLARGED PLANS.
7. PLANS INDICATE INTERIOR AND EXTERIOR BUILDING DIMENSIONS, INTERIOR PLAN DETAIL DESIGNATIONS, INTERIOR ELEVATION DESIGNATIONS, PARTITION TYPE DESIGNATIONS, FINISH DESIGNATIONS, AND GENERAL BUILDING MATERIAL. GENERAL CONTRACTOR TO COORDINATE ADDITIONAL REQUIREMENTS OF INTERIOR AND EXTERIOR WALL FINISHES AND COMPONENTS. REFER TO PARTITION TYPES, FINISH SCHEDULE, SIGNAGE SCHEDULE, DOOR AND HARDWARE SCHEDULE, AND WINDOW TYPES FOR ADDITIONAL INFORMATION.
8. ALL DETAILS ARE TYPICAL UNLESS NOTED OTHERWISE; INCORPORATE INTO PROJECT AT NOTED AND/OR APPROPRIATE LOCATIONS WHETHER SPECIFICALLY INDICATED OR NOT.
9. GENERAL CONTRACTOR WILL VERIFY THE FOLLOWING WITH THE RESPECTIVE, RELATED, AND AFFECTED TRADES:
   A. SIZES AND LOCATIONS FOR BACKING/BLOCKING REQUIRED FOR MOUNTING MECHANICAL, ELECTRICAL, PLUMBING AND/OR FIRE SUPPRESSION EQUIPMENT
   B. SIZES AND LOCATIONS OF MECHANICAL, ELECTRICAL, PLUMBING AND/OR FIRE SUPPRESSION PENETRATIONS
   C. CUTTING AND PATCHING FOR WORK REQUIRED BY MECHANICAL, ELECTRICAL, PLUMBING AND/OR FIRE SUPPRESSION
10. FOR SITE AND PAVEMENT ITEMS CIVIL DOCUMENTS TAKE PRECEDENCE OVER ALL ARCHITECTURAL DOCUMENTS UNLESS NOTED OTHERWISE ON CIVIL. GENERAL CONTRACTOR TO COORDINATE ALL SITE ITEMS WITH ALL OTHER DISCIPLINES.
11. THE BUILDING MUST BE TIED TO THE PROPERTY LINE IN TWO DIRECTIONS, AND CONTRACTOR TO NOTIFY ARCHITECT BEFORE START OF WORK IF THERE ARE ANY OMISSIONS TO THIS REQUIREMENT IN THE DRAWING. CONTRACTOR TO START BUILDING CONSTRUCTION @ DESIGNATED "START POINT" UNLESS NOTED OTHERWISE.
12. ALL TYPES OF PERIMETER FENCING TO BE ERECTED ON PROPERTY LINE.
13. REFER TO CIVIL DRAWINGS FOR ADDITIONAL SITE INFORMATION AND DETAILS
14. ELEVATION MARKERS SHOWN ON SLOPED ROOFS REPRESENT THICKNESS OF TAPERED RIGID INSULATION ABOVE THE MINIMUM ROOF BASE RIGID INSULATION.
15. REFERENCE MEP DOCUMENTS FOR ROOF TOP UNIT LOCATIONS AND STRUCTURAL DOCUMENTS FOR SUPPORT AS REQUIRED.
16. WALK/TRAFFIC PADS TO BE PROVIDED AND INSTALLED FROM ROOF ACCESS TO AND AROUND ALL ROOF EQUIPMENT - HVAC, ELECTRICAL, PLUMBING, ETC.
17. FLOOR AND ROOF FRAMING SHOWN IN ARCHITECTURAL DRAWINGS ARE FOR REFERENCE ONLY; RE: STRUCTURAL.
18. REFER TO PARTITION TYPES SHEET(S) FOR STANDARD DETAILS PERTAINING TO THE PARTITION TYPES. ONE OR MORE OF THE DETAILS MAY PERTAIN TO EACH PARTITION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AND REFERENCE ALL STANDARD PARTITION DETAILS. THE CONTRACTOR IS TO IMMEDIATELY CONTACT THE ARCHITECT IF ANY QUESTIONS ARISE.
19. EXTERIOR DIMENSIONS ARE GIVEN TO EITHER THE EDGE OF SLAB, FACE OF CMU, OR THE EXTERIOR FACE OF STUD WALLS UNLESS NOTED OTHERWISE. DIMENSIONS TO INTERIOR PARTITIONS ARE TO THE FACE OF STUD OR CMU UNLESS NOTED OTHERWISE.
20. PROVIDE CODE COMPLIANT FIRE RETARDANT NON-COMBUSTIBLE BLOCKING, SUPPORTS, BACKING, ETC., FOR SECURE INSTALLATION OF WALL AND CEILING MOUNTED ITEMS.THIS INCLUDES, BUT IS NOT LIMITED TO, MILLWORK, WALL LIGHT FIXTURES, TV BRACKETS, PLUMBING FIXTURES, TOILET ACCESSORIES, HANDRAILS, AND GUARDRAILS. CONTRACTOR TO DETERMINE TYPE OF BLOCKING AND ANCHORING AS REQUIRED TO SUIT INSTALLATION AND WALL CONDITION. BLOCKING IS IN ADDITION TO NOTED PARTITION CONSTRUCTION, AND IS NOT MEANT TO REPLACE THE PARTITION CONSTRUCTION. BLOCKING IS NOT TO INTERFERE OR DEGRADE A PARTITION OR CEILING'S SMOKE AND/OR FIRE RATING.
21. REFER TO DOOR SCHEDULES, WINDOW TYPES, AND DETAILS FOR CONSTRUCTION OF OPENINGS IN THE PARTITIONS
22. PROVIDE LINTELS OR HEADERS AS REQUIRED OR DIRECTED OVER OPENINGS PENETRATED BY MECHANICAL EQUIPMENT, WINDOWS, DOORS, AND/OR OTHER OPENINGS.
23. HINGE SIDE OF ALL DOORS ARE LOCATED 4" FROM ADJACENT WALL UNLESS NOTED OTHERWISE
24. PROVIDE FIRE STOPPING AT ALL PENETRATIONS OF WALLS AND FLOORS AS SPECIFIED IN CONTRACT DOCUMENTS AND SPEC SECTION - FIRESTOPPING
25. FOR ALL SMOKE AND/OR FIRE RATED PARTITIONS THE DESIGNATED UL DESIGN IS TO BE MAINTAINED WITHOUT EXCEPTION. ALL PENETRATIONS AND OPENINGS ARE TO BE SEALED WITH AN APPROVED UL DESIGN OR DESIGNATED DETAIL. THESE DRAWINGS DO NOT LIST ALL THE UL DESIGNS NECESSARY TO MAINTAIN A PARTITION'S SMOKE AND/OR FIRE RATING. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO ENSURE ALL RATED PARTITIONS FULLY MEET UL REQUIREMENTS.
26. REFER TO PARTITION DESIGN CRITERIA ON PARTITION TYPES SHEET FOR PARTITION DESIGN LIMITATIONS
27. THERE ARE ITEMS SHOWN,SUCH AS OUTLETS, SWITCHES, THERMOSTATS, ETC., ON THE MEPF DRAWINGS THAT ARE NOT DRAWN ON THE ARCHITECTURAL ELEVATIONS. CONTRACTOR TO COORDINATE AND MOUNT ALL MEPF ITEMS PER STANDARD MOUNTING LOCATIONS & TOILET ROOM CONFIGURATION SHEET(S) UNLESS NOTED OTHERWISE. RECEPTACLES MOUNTED ABOVE COUNTERTOPS/BACKSPLASHES ARE TO BE 42" AFF TO CENTERLINE OF COVERPLATE AND ARE TO BE INSTALLED HORIZONTALLY, UNLESS NOTED OTHERWISE. COORDINATE ALL MEP ACCESS PANELS NOT SHOWN ON ARCHITECTURAL CONSTRUCTION DOCUMENTS WITH ARCHITECT PRIOR TO INSTALLATION.
28. HOT WATER LINES AND DRAIN LINES UNDERNEATH ACCESSIBLE SINKS SHALL BE INSULATED
29. IN GYPSUM BOARD CEILINGS LOCATE ALL HVAC ITEMS, EMERGENCY LIGHTING, SPRINKLER HEADS IN CENTER OF SPACE AND EQUAL DISTANT APART FROM EACH OTHER UNLESS NOTED OTHERWISE. IN LAY-IN ACOUSTICAL CEILINGS LOCATE ALL HVAC ITEMS, EMERGENCY LIGHTING, SPRINKLER HEADS, ETC. IN CENTER OF TILE UNLESS NOTED OTHERWISE.
30. COORDINATE ALL MEPF ITEMS IN WALL, FLOOR, AND CEILING NOT SHOWN ON THE ARCHITECTURAL CONSTRUCTION DOCUMENTS WITH ARCHITECT AND MEPF PRIOR TO INSTALLATION. ALL LOCATIONS TO BE SHOWN ON SUBMITTAL DRAWINGS TO ASSIST WITH COORDINATION.
31. IN EXPOSED CEILINGS EVENLY SPACE ALL FIXTURES AT OR BELOW EXPOSED STRUCTURE OR MEP DUCTWORK. COORDINATE LIGHTING WITH FINAL MEPF LAYOUT TO AVOID SHADOWS AND DARK SPOTS.
32. FOR CONCEALED TYPE SPRINKLER HEADS, ARCHITECT WILL COORDINATE W/OWNER FINISH OF SHIELD (STAINLESS STEEL, WHITE, ETC.). TYPICAL HEAD FINISH TO MATCH ADJACENT SURFACE COLOR, IF POSSIBLE.
33. REFER TO FINISH PLANS AND SCHEDULES, INTERIOR AND EXTERIOR ELEVATIONS, SECTIONS AND DETAILS FOR ALL FINISHES
34. PROVIDE FINISHES AS SCHEDULED AND SELECTED BY ARCHITECT
35. PROVIDE NON-SLIP SURFACE FINISH IN WET AREAS
36. FINISHES CONTINUE BEHIND AND BENEATH ALL EQUIPMENT, MILLWORK, AND CASEWORK U.N.O.
37. EXPOSED INTERIOR STRUCTURAL STEEL TO BE EXTERIOR GRADE PAINT FINISH, RE: FINISH SCHEDULE U.N.O,
38. ALL ELECTRONIC CUT VINYL GRAPHICS TO BE INSTALLED ON LEVEL 5 GYPSUM WALL FINISH. USE HIGH-TACK ADHESIVE FOR ALL VINYL GRAPHICS. GC TO VERIFY FINAL WALL GRAPHIC AND FONT WITH ARCHITECT PRIOR TO PURCHASE & INSTALLATION.
39. EXPOSED ENDS OF ALL PROJECTING ELEMENTS SUCH AS SILLS, LEDGES & SIMILAR COMPONENTS FABRICATED IN METAL, STONE & OTHER MATERIALS SHALL BE FINISHED SAME AS FACE
40. CENTER LAY-IN ACOUSTICAL CEILING SYSTEM IN EACH ROOM WITH EQUAL TILE DIMENSIONS ON OPPOSITE WALLS UNLESS NOTED OTHERWISE. NOTIFY ARCHITECT IF ANY TILE ABUTTING THE PARTITION IS LESS THAN 6" IN WIDTH. SECONDARY WALL ANGLES TO SUPPORT SHORT RUNS WILL NOT BE ACCEPTED.
41. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS FOR MILLWORK AND CASEWORK
42. ALL CUSTOM MILLWORK, IF IN SCOPE OF WORK, IS SHOWN IN ELEVATION AND DESIGNED PER DESIGNATED DETAILS. REFER TO INTERIOR ELEVATIONS, MILLWORK DETAILS, AND RELATED SPECIFICATION DIVISIONS FOR ADDITIONAL INFORMATION.
43. ALL MANUFACTURED CASEWORK, IF IN SCOPE OF WORK, IS DESIGNATED ON ENLARGED FLOOR PLANS. REFER TO CASEWORK SCHEDULE AND RELATED SPECIFICATION DIVISIONS FOR DETAILED INFORMATION. CONTRACTOR IS TO FOLLOW THE SCHEDULED MANUFACTURER'S SPECIFICATIONS, INSTRUCTIONS, AND RECOMMENDATIONS UNLESS DIRECTED OTHERWISE BY THE CONTRACT MANUAL.

CONTRACT DOCUMENTS GENERAL INFORMATION (5)

1. THESE DRAWINGS INDICATE THE GENERAL SCOPE OF THE PROJECT IN TERMS OF THE ARCHITECTURAL DESIGN CONCEPT, THE MAJOR DIMENSIONS, AND THE MAJOR ARCHITECTURAL, STRUCTURAL, MECHANICAL & PLUMBING ELEMENTS.
2. AS SCOPE DOCUMENTS THEY DO NOT INDICATE ALL WORK REQUIRED FOR FULL PERFORMANCE AND COMPLETION OF THE JOB. ON THE BASIS OF THE GENERAL WORK INDICATED, ALL CONTRACTORS (AND SUBCONTRACTORS) SHALL FURNISH ALL ITEMS REQUIRED FOR THE PROPER EXECUTION AND TIMELY COMPLETION OF THE WORK.
3. PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THAT ALL REQUIRED PERMITS AND APPROVALS HAVE BEEN OBTAINED. NO CONSTRUCTION OR FABRICATION OF ANY ITEM SHALL BEGIN UNTIL THE CONTRACTOR HAS RECEIVED ALL PLANS AND ANY OTHER DOCUMENTATION FROM ALL OF THE PERMITTING AND ANY OTHER REGULATORY AUTHORITIES. FAILURE OF THE CONTRACTOR TO FOLLOW THIS PROCEDURE SHALL CAUSE THE CONTRACTOR TO ASSUME FULL RESPONSIBILITY FOR ANY SUBSEQUENT MODIFICATION OF THE WORK MANDATED BY ANY REGULATORY AUTHORITY.
4. ALL WORK SHALL COMPLY WITH APPLICABLE STATE AND LOCAL CODES AND ALL NECESSARY LICENSES AND PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT THEIR EXPENSE UNLESS PREVIOUSLY OBTAINED BY THE OWNER.
5. ALL WORK SHALL BE PERFORMED IN A FINISHED AND WORKMANLIKE MANNER TO THE ENTIRE SATISFACTION OF THE OWNER & ARCHITECT AND IN ACCORDANCE WITH THE BEST RECOGNIZED TRADE PRACTICES.
6. CONTRACTOR WILL BE HELD TO HAVE STUDIED THE CONTRACT DOCUMENTS, TO HAVE VISITED THE SITE, AND TO HAVE SATISFIED THEMSELVES REGARDING ALL EXISTING CONDITIONS UNDER WHICH THEY WILL BE OBLIGED TO OPERATE. CONTRACTOR SHALL IMMEDIATELY REPORT ANY ERROR, INCONSISTENCY, OR OMISSION TO THE ARCHITECT AS AN RFI FOR REQUIRED CLARIFICATION FROM THE OWNER AND/OR A/E TEAM. WHEN DISCREPANCIES EXIST IN THE CONTRACT DOCUMENTS AND WHEN THE CONTRACTOR DOES NOT REQUEST A CLARIFICATION AS TO WHICH ITEM, STATEMENT, ETC. IS THE CORRECT AND/OR PREFERRED MATERIAL(S), CONSTRUCTION, COMPOSITION, DETAILING, ETC. THEN THE MOST EXPENSIVE SHALL BE INSTALLED AT NO ADDITIONAL COST TO THE PROJECT.
7. CONTRACTOR IS TO PROVIDE AND INSTALL ALL NECESSARY PROTECTIVE DEVICES REQUIRED TO PROTECT ANY EQUIPMENT (CONTRACTOR PROVIDED AND/OR OWNER PROVIDED) INSTALLED PRIOR TO THE COMPLETION OF THE WORK.
8. CONTRACTOR SHALL COORDINATE ALL DELIVERIES AND ACCESSIBLITY TO THE BUILDING FOR ALL ITEMS.
9. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF ALL UTILITIES WITHIN THE LIMITS OF THE WORK PRIOR TO THE START OF SITE WORK. ALL DAMAGES MADE TO THE EXISTING UTILITIES BY THE CONTRACTOR SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
10. CONTRACTOR SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT, FIXTURES, AND SERVICE NECESSARY FOR THE PROPER EXECUTION OF THE WORK SHOWN IN THE CONTRACT DOCUMENTS.
11. ALL MATERIALS AND EQUIPMENT INCORPORATED IN THE WORK SHALL BE NEW AND ALL WORK BE OF GOOD QUALITY, FREE FROM FAULTS, AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS.
12. CONTRACTOR SHALL KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR OPERATIONS. AT THE COMPLETION OF THE WORK THE CONTRACTOR SHALL PERFORM A FINAL CLEAN-UP, INSIDE AND OUT, CLEAN ALL GLASS SURFACES AND LEAVE THE PROJECT AREA CLEAN.
13. CONTRACTOR SHALL GUARANTEE FOR 1 (ONE) YEAR UNLESS NOTED OTHERWISE IN OWNER-CONTRACTOR AGREEMENT THAT ALL OF THE WORK UNDER THE CONTRACT IS FREE FROM FAULTY MATERIALS, WATER-TIGHT AND LEAK-PROOF IN EVERY PARTICULAR AND FREE FROM IMPROPER WORKMANSHIP.
14. CONTRACTOR SHALL SUPERVISE THE WORK AND COORDINATE ALL PORTIONS THEREOF.
15. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF EXISTING AND NEW WORK. ANY WORK DAMAGE FOR ANY REASON SHALL BE REPLACED AT NO COST TO THE OWNER.
16. CONTRACTOR SHALL NOT SCALE DRAWINGS - LARGER DRAWINGS AND DETAILS SHALL TAKE PRECEDENCE OVER SMALLER DRAWINGS AND DETAILS.
17. ALL EXISTING SITE COMPONENTS TO-REMAIN SHALL BE PROTECTED DURING CONSTRUCTION. ALL DAMAGED SURFACES AND EQUIPMENT SHALL BE REPAIRED OR REPLACED BY CONTRACTOR AS REQUIRED BY THE OWNER AND/OR OWNER'S REPRESENTATIVE.
18. ALL ITEMS ARE CONSIDERED TO BE "NEW" UNLESS NOTED OTHERWISE.
19. THE DRAWINGS & SPECIFICATIONS ARE COMPLEMENTARY DOCUMENTS. NEITHER TAKE PRECEDENT OVER THE OTHER. CONFLICTS IN SPECIFICATIONS AND DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT FOR CLARIFICATION.
20. ALL CONSTRUCTION SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE LOCAL, STATE, AND FEDERAL CODES OR REGULATIONS.
21. ALL NEW CONSTRUCTION SHALL MEET CURRENT REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT, AND TEXAS ACCESSIBILITY STANDARDS.
22. THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UNDERGROUND UTILITIES BEFORE PROCEEDING WITH EXCAVATION, TRENCHING OR SIMILAR WORK. THESE DRAWINGS DO NOT CERTIFY THE EXISTENCE OF UTILITIES, EASEMENTS, AND/OR SETBACKS WHICH MAY BE PRESENT BUT UNRECORDED AND/OR UNDETECTED.
23. ALL SUBSTITUTIONS OF MATERIALS AND ASSEMBLIES MUST BE APPROVED BY ARCHITECT IN ACCORDANCE WITH THE SPECIFICATIONS.
24. CONTRACTOR IS REQUIRED TO PROVIDE CONTROL AND EXPANSION JOINTS IN ALL ASSEMBLIES PER CONTRACT DOCUMENTS.
25. CONTRACTOR SHALL PROVIDE ACCESS TO ALL FIRE DAMPER ASSEMBLIES AS NOTED IN CONTRACT DOCUMENTS.
26. ALL PIPING, DUCTWORK AND CONDUIT TO BE CONCEALED UNLESS NOTED OTHERWISE.
27. SITE SURVEY IS PROVIDED BY OTHERS AND IS INCLUDED FOR INFORMATION ONLY. ALL CONDITIONS TO BE FIELD VERIFIED BY CONTRACTOR.
28. CONTRACTOR SHALL MAINTAIN SITE DRAINAGE DURING CONSTRUCTION.
29. CONTRACTOR SHALL MAINTAIN A CLEAN AND SECURE SITE AS REQUIRED BY CONTRACT DOCUMENTS, CONSTRUCTION FACILITIES, AND TEMPORARY CONTROLS.

DEMO GENERAL AND SITE NOTES (2)

GD1. GC to visit the site to become familiar with the scope of work and to field verify existing conditions prior to bidding this project. Report any and all discrepancies or ambiguous items to the architect prior to bidding for clarification.

GD2. Note that there are demolition notes on the Civil and MEP plans, as well. Provide all other demolition work required by construction sequencing and means and methods to install the new and remodeled work shown, whether such related and necessary demolition work is specifically noted on these drawings or not.

GD3. Coordinate demolition work with floor plans. Refer to sections and details for frame types and details at new openings in existing walls.

GD4. Refer to Civil and MEP drawings for additional demolition and alteration notes.

GD5. Prior to start of demolition, secure from the owner a list of additional existing building components to be salvaged such that salvaged components are delivered to the owner in their existing condition.

GD6. The Owner has first rights of salvage of all fixtures, equipment and building materials removed as part of the demolition and not reused in the new construction.
Remove all other debris and waste from the site and dispose of properly, in accordance with any applicable federal, state and local regulations.

GD7. Refer to Index Sheet G.000 for typical graphic symbols and abbreviation index.

GD8. Refer to demolition photographs for additional information and guidelines. Photographs are for reference ONLY unless otherwise noted. All photographs are included for Contractor's reference ONLY unless noted otherwise. The photographs are to be used in conjunction with all drawings, both plan and elevations. Information presented on all drawings supercedes any information noted on photographs. It is not the Architect's intent to present the entire scope of work or all built conditions by the use of photographs. It is the responsibility of the Contractor to verify the scope of work and ALL build conditions in the field prior to start of work.

GD9. Refer to specifications Division 1 for further demolition standards and requirements.

GD10. Prior to cutting or altering any opening in an existing wall, footing or roof deck provide shoring, bracing and supports as required to maintain the structural integrity of the building/structure.

GD11. Prior to removing any existing bearing wall provide shoring, bracing and supports required to maintain the structural integrity of the building/structure.

GD12. Provide materials for cutting and patching which will result in equal-or-better work than what was removed. Surface to match existing, U.NO.

GD13. Existing construction that is being removed shall be removed carefully so as not to damage any existing construction that is to remain. All surfaces surrounding objects being removed are to be repaired and patched (in a rectangular pattern) to match existing conditions and made ready to receive any new finishes where applicable.

GD14. Plumbing lines that are to be removed shall be removed completely or be capped as closed to point of entry in floor or wall as possible, if removal is not possible.
Patch floors and walls to match existing conditions.

GD15. Where existing flooring, ceilings or wall finishes are to be removed and replaced with new finishes the surfaces to remain shall be stripped clean of all existing finishes and made ready to receive new finishes.

GD16. Floor finishes being replaced shall be completely removed, and the floor cleaned and properly prepared prior to installation of new finish material. Inspect all floors that receive new finishes to assess existing conditions prior to commencement of construction. Patch, fill and strip floor as required, to provide a smooth, durable surface free of burrs and adhesive and suitable for application of new finish material. Under cut doors as required to accommodate new floor finishes.

GD17. Where new concrete topping is being poured over existing concrete slab: bush hammer existing concrete finish for better bond.

GD18. Where existing door openings are to be sealed: remove frame and patch wall with the same material and finish as the existing construction. New and existing wall shall align.

GD19. Where light fixtures are being removed or replaced, ceiling surfaces shall be cleaned, repaired and patched to match the adjacent surfaces prior to installation of new light fixtures.

GD20. Where door frames are to remain, repair frame - fill hinge pocket and all holes in frame to create finished case opening. Clean, sand smooth and paint frame to match existing door frames.

GD21. Where wall mounted urinal and water closets are to be removed, remove flush valves and prepare surfaces to be sloped and to drain to existing floor drain. Prep surfaces to receive new finish.

GD22. Remove floor slab as required for new restroom fixtures. Patch and repair slab to match existing.

Division 1 - General Requirements

1.01	Temporary facilities and controls
1.02	Temporary construction
1.03	Temporary dustproof partition
1.04	Temporary protective floor cover
1.05	Temporary protective passageway
1.06	Temporary protective wall cover
1.07	Temporary shoring, bracing and support
1.08	Temporary weatherproof closure

Division D2 - Site Work Demolition

D2.01	Remove concrete paving as indicated; re: Civil
D2.02	Remove asphalt paving as indicated; re: Civil
D2.03	Remove concrete curb as required for new construction; re: Civil
D2.04	Remove Basket Ball Hoop, concrete and prepare to receive new Landscape
D2.05	Clear out this area to prepare for new access street.
D2.06	Remove site fencing and curb to this line as necessary for New Construction. Salvage Fence as directed by Owners. Prepare to receive new landscape.
D2.07	Remove Chain-link Fence and Gate; patch and prepare surface to receive new Fence and Gate
D2.08	Remove concrete walk as indicated
D2.09	Existing Site Fence and Gate to Remain
D2.10	Remove metal wall panels and metal stud walls, structure to remain
D2.11	Existing light pole to be removed; re: Electrical and Civil
D2.12	Existing light pole to remain; re: Electrical and Civil
D2.13	Remove and Clean up this area to receive new landscape; Re Landscape
D2.14	Remove all exterior light fixtures, camera and wall mounted objects to receive new exterior metal wall panel.
D2.15	Remove debris and clean up existing concrete floor to receive new flooring; re: finish plan
D2.16	Remove stair; patch and prepare surfaces for new floor finishes
D2.17	Remove plumbing fixture as noted
D2.18	Remove wall, door and window in this area to receve new hollow metal frame and door. Re: proposed floor plans.
D2.19	Demo wall base, wall finish and wall where indicated; prepare for new construction
D2.20	Demo wall finish to tilt wall beyond
D2.21	Remove wall, wall base, and floor finishes
D2.22	Remove wall finishes; patch and prepare surface for new construction
D2.23	Remove wall base finishes; patch and prepare surface for new construction
D2.24	Remove wall board and trim
D2.25	Remove flooring
D2.26	Remove floor finishes; patch and prepare surface for new construction
D2.27	Replace damaged floor tiles to match existing
D2.28	Remove door
D2.29	Remove door and frame; patch and prepare surface for new construction
D2.30	Remove glazing system
D2.31	Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.32	Remove pass-thru window
D2.33	Remove casement opening trim
D2.34	Remove, protect, prepare for replacement tubular daylighting device
D2.35	Remove canopy
D2.36	Remove covered canopy as indicated; remove structure to nearest beam and column
D2.37	Remove millwork
D2.38	Remove existing gutters and prepare for new gutters
D2.39	Remove roof
D2.40	Remove downspouts
D2.41	Remove metal coping
D2.42	Remove ceiling tiles and grid system
D2.43	Replace damaged ceiling tiles to match existing
D2.44	Remove gypsum board ceiling and support system
D2.45	Remove light fixture
D2.47	Remove mop sink
D2.48	Remove furr-out to structure

1. Reference this sheet if key note is missing from any following sheets.

Not all notes are used in this project

JC DIVERSION CENTER RENOVATION

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SEAL:

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

MASTER KEY NOTES & GENERAL NOTES

Scale: AS NOTED

G.050

Division D2 - Site Work Demolition

D2.50 Remove MEP, Re: MEP
D2.51 Remove floor drain cover, Re: MEP
D2.52 Remove drinking fountain; prepare surface for new construction Re: MEP
D2.53 Remove skylight
D2.54 Remove planter
D2.55 Remove restroom accessories
D2.56 Remove shelving system.; patch and prepare surface for new construction
D2.57 Remove existing propane tank and all associate piping, Re: MEP
D2.58 Structure to remain; re: Structural
D2.60 Existing concrete curb cut to remain, re: Civil
D2.61 Existing concrete parking to remain, re: Civil
D2.62 Existing asphalt parking to remain, re: Civil
D2.63 Existing concrete curb to remain, re: Civil
D2.64 Roof to remain
D2.65 Landscape to remain, re: Landscape
D2.66 Existing tree(s) to remain; re: Landscape
D2.67 Existing gate to remain
D2.68 Fence to remain
D2.69 Mechanical to remain; re: MEP
D2.70 Existing structure to be removed by Owner
D2.71 Existing wall to remain
D2.72 Existing door to remain
D2.73 Existing window to remain, reseal window and glazing
D2.74 Roof scuttle/hatch to remain
D2.75 Stair to remain
D2.76 Ramp to remain
D2.77 Millwork to remain; remove existing plastic laminate and prepare surfaces for new finishes, re: Finish schedule
D2.78 Patch and prepare roof for new construction
D2.79 Remove column surround. Structure to remain.
D2.80 Existing turndown to remain
D2.81 Patch & repair existing ceiling finishes after installation of Mechanical equipment/piping; match existing and/or new adjacent surfaces as noted
D2.82 Light fixtures to remain. Clean existing for like-new appearance. Replace damaged or broken light fixtures to match existing.
D2.83 Plumbing fixture to remain. Clean existing
D2.84 Remove security cameras
D2.85 Remove metal soffit and sides. Patch and prepare surface for new construction
D2.86 Remove existing Louvered exhaust vent and prepare for new construction
D2.87 Remove railing; patch and prepare surface for new construction
D2.88 Remove floor finishes, platform and platform structure; patch and prepare surface for new floor finishes
D2.89 Existing light pole to be removed; re: Electrical
D2.90 Existing light pole to remain; re: Electrical
D2.91 Remove Window and Frame. Infill interior CMU wall for new construction
D2.92 Remove interior CMU wall to receive new Window for new construction
D2.93 Remove Door and Frame. Infill wall to receive new Window for new construction
D2.95 Remove mop sink, cap and remove plumbing fixture and drain; patch and prepare surface for new construction

Division 2 - Site Work

2.01 Work in this room work at this location
2.02 Existing building
2.03 New building
2.04 Finish floor elevation, re: Civil
2.05 Area of construction
2.06 Area to remain undeveloped
2.07 Protect trees as-noted within area of work; re: Landscape
2.08 Harris County Flood Control District easement
2.09 New concrete paving; re: Civil for layout of paving expansion joints and control joints
2.10 New asphalt paving; re: Civil
2.11 Crushed concrete paving area; re: Civil
2.12 Permeable pavers; re: Civil
2.13 Parking stripes; 4" wide, white
2.14 Diagonal striping; 4" wide at 2'-0" O.C., white
2.15 Fire lane striping; 4" wide, red
2.16 Drive lane striping; 4" wide, yellow
2.17 Accessible parking stall with signage; re: 13/A.040 and 15/A.040
2.18 Van Accessible parking stall with signage; re: 15/A.040
2.19 LEED parking stall with signage, re: Signage schedule
2.20 Curb cut and new concrete drive; re: Civil
2.21 Curb cut and new asphalt drive; re: Civil
2.22 Concrete curb at landscape; re: 5/A.040
2.23 Concrete curb at paving; re: 6/A.040
2.24 Concrete curb at crushed concrete parking; re: Civil
2.25 No curb at this location
2.26 Concrete curb radius, Re: Site dimensions and Civil
2.27 Sloped curb
2.28 Mechanical gate, re: Electrical
2.29 Water feature, re: Landscape and MEP
2.30 Detention pond; re: Civil
2.31 Trash container/dumpster area, re: Plans and details
2.32 Concrete walk at landscape, re: Civil for expansion and control joint notes; re: 1/A.040
2.33 Concrete walk at new/existing concrete curb, re: Civil for expansion and control joint notes; re: 7/A.040
2.34 Concrete walk at building edge, re: Civil for expansion and control joint notes; re: 9/A.040
2.35 Concrete walk at existing concrete walk, re: Civil for expansion and control joint notes; re: 11/A.040
2.36 Concrete walk, re: Civil for expansion and control joint notes
2.37 Decomposed granite trail; re: 4/A.040
2.38 Gravel landscape
2.39 Concrete accessible ramp section; re: 10/A.040
2.40 Concrete accessible ramp plan; re: 14/A.040
2.41 Flagpole base detail; re: 8/A.040
2.42 Landscaped median; re: Landscape
2.43 8'-0" high treated wood fence
2.44 6'-0" high wrought iron fence & gates
2.45 Metal screen fence
2.47 Double gate, reference plans and schedules for width and hardware. Provide gate latch with padlock and cane bolts.
2.48 Monument sign, re: Structural, Electrical & IT for connection coordination
2.49 Bench, re: Plans and Landscape
2.50 New tree; re: Landscape
2.51 Concrete Wheel stop
2.52 Concrete speed bump, re: Civil
2.53 Concrete mow strip; re: Landscape
2.54 Bicycle rack, re: Equipment schedule
2.55 30' x 20' pre-engineered trellis shade structure, re: Structural
2.56 Pool, pool deck, and water park area; re: Landscape, Pool Consultant, and MEP
2.57 Fire hydrant; re: Civil
2.58 Fire line vault; re: Civil
2.59 Domestic water line vault; re: Civil
2.60 Planting and irrigation system; re: Landscape
2.61 Irrigation system with controller, backflow preventer and meter; re: Landscape & IT for control coordination
2.62 Vehicular directional arrow to meet TXDOT requirements; white
2.63 Solid sod this area; re: Landscape
2.64 Hydromulch this area; re: Landscape
2.65 Provide (2) 4" sleeves in 8" of cement stabilized sand; GC shall clearly mark ends of sleeve at finished ground with brass peg

Division 3 - Concrete

3.01 Concrete slab; re: Structural
3.02 Recessed slab area; re: Structural
3.03 Mezzanine slab; re: Structural
3.04 Concrete decking; re: Structural
3.05 Concrete steps; re: Structural
3.06 Concrete fill steps/landing
3.07 Concrete ramp; re: Structural
3.08 Concrete column base; re: Structural
3.09 Concrete wall to match tilt-wall
3.10 Tilt-wall, painted; re: Structural
3.11 Lightweight insulating concrete; sloped to drain; re: Specifications
3.12 Concrete grade beam; re: Structural
3.13 Housekeeping pad, re: Structural and MEP for thickness and detailing
3.14 Vapor barrier; re: Structural
3.15 Sawcut control joint; not to extend/overlap at end points
3.16 Reinforcing steel; re: Structural
3.17 Welded wire mesh; re: Structural
3.18 Existing slab; Field verify
3.19 Cast in place concrete wall. Architectural concrete finish on all exposed concrete surfaces; re: structural & specs

Division 4 - Masonry

4.01 4" thick standard CMU, re: Finish schedule
4.02 6" thick standard CMU, re: Finish schedule
4.03 8" thick standard running bond CMU, re: Finish schedule
4.04 12" thick standard CMU, re: Finish schedule
4.05 2-1/2" thick CMU soap, re: Finish schedule
4.06 8" thick CMU sound block
4.07 12" thick CMU sound block
4.08 4" high starter course
4.09 Stone veneer, re: Finish schedule
4.10 Cast stone, re: Finish schedule
4.11 Limestone veneer system; re: Finish schedule
4.12 Glass masonry unit, re: Finish and Glazing schedules
4.13 Face brick, re: Finish schedule
4.14 Soldier course, re: Finish schedule
4.15 Rowlock course, re: Finish schedule
4.16 Cap brick, re: Finish schedule
4.17 Chamfered window sill
4.18 Bond beam; re: Structural
4.19 Bullnose corner
4.20 Tapered coping with drip edge, re: Finish schedule
4.21 Masonry anchor
4.22 New masonry wall to match existing wall
4.23 Horizontal joint reinforcing
4.24 Expansion joint anchors
4.25 Expansion joint filler
4.26 Bond breaker strip
4.27 Mortar net
4.28 Weep holes @ 24" O.C.
4.29 Masonry control joint, install per manufacturers requirements and recommendations
4.30 Masonry expansion joint, install per manufacturers requirements and recommendations
4.31 Fill air space with masonry grout to height shown
4.32 Fill cells of CMU with masonry grout to height shown; re: Structural
4.33 Fill cells of CMU with masonry grout & provide reinforcing; re: Structural
4.34 Masonry grout fill
4.35 Non-shrink grout; re: Structural/Specifications
4.36 Expansion strips
4.37 Panel anchors
4.38 Asphalt emulsion
4.39 Existing 8" thick running bond CMU; re: Finish Schedule
4.40 Existing brick facade to be power washed; existing mortar to be repointed, color to be verified by architect
4.42 Fill jamb cells of CMU with masonry grout & provide reinforcing; re: Structural
4.43 Galvanized masonry anchors
4.44 Horizontal masonry reinforcement as specified
4.45 CMU Lintel; re: Structural

Division 5 - Metals

5.01 Steel column; re: Structural
5.02 Galvanized steel column; re: Structural
5.03 Steel beam; re: Structural
5.04 Galvanized steel beam; re: Structural
5.05 Steel joist; re: Structural
5.06 Galvanized steel joist; re: Structural
5.07 Steel deck; re: Structural
5.08 Steel tube; re: Structural
5.09 Galvanized steel tube; re: Structural
5.10 2"x5"x1/4" steel tubes beyond in walls anchored to slab w/ expansion anchors and clips
5.11 1 1/2" stainless steel tube
5.12 Steel angle; re: Structural
5.13 Galvanized steel angle; re: Structural
5.14 Stainless steel angle
5.15 Galvanized steel lintel angle; re: Structural
5.16 Termination angle; re: Structural
5.17 Above ceiling angle support for storefront/entrances; re: Structural
5.18 Steel purlins; re: Structural
5.19 Steel girts; re: Structural
5.20 Wind bracing; re: Structural
5.21 Bent plate; re: Structural
5.22 Steel pan stair
5.23 Anchor bolt; re: Structural
5.24 Roof sump pan; re: Structural
5.25 Steel shear tab; re: Structural
5.26 Embedded steel plate; re: Structural
5.27 Galvanized steel plate welded to structure beyond, re: Structural
5.28 Galvanized steel canopy frame; re: Structural
5.29 Galvanized steel channel; re: Structural
5.30 Pipe bollard, grout-filled; re: 17/A.040
5.31 Termination cable pipe bollard; re: 18/A.040
5.32 Load-bearing metal stud system; re: Structural
5.33 Double studs at all exterior door and window jambs, full height
5.34 Prefinished metal building wall panel, re: Finish Schedule
5.35 Perforated metal screen, re: Finish Schedule
5.36 Perforated zinc metal panel screen; re: Finish Schedule
5.37 New metal panel on existing structure; re: Finish Schedule
5.38 Stair/Step nosing
5.39 Wall ladder, painted; GC to provide required blocking, re: Finish Schedule
5.40 Galvanized steel ladder; GC to provide required blocking
5.41 2"x2" galvanized steel tube countertop frame
5.42 1/4" thick galvanized steel plate
5.43 Perforated galvanized metal screen wall, re: Finish Schedule
5.44 1 1/2" diameter steel handrails painted, re: Finish Schedule
5.45 1 1/2" diameter steel guardrails with 1/2" vertical steel pickets spaced 4" O.C. max painted
5.46 Prefabricated stair, re: Structural and Finish schedule
5.47 Prefinished metal soffit panels, re: Finish Schedule
5.48 Foot scraper; re: 3/A.040
5.49 Continuous Unistrut support, 1-5/8" x 2-7/16"
5.50 Pipe support(s); re: Mechanical
5.51 6" galvanized CPMF; re: Structural
5.52 Steel base plate. Anchor bolt to concrete panel; re: Structural
5.53 Steel connection plate; re: Structural
5.54 Steel stiffener plate; re: Structural
5.55 Steel rails for electrical conveying cart, embed in concrete slab, re: Structural
5.56 Aluminum framed sunscreen with perforated zinc metal panel, re: Structural
5.57 Metal equipment screen with structural tube steel support, re: Structural
5.58 Wall expansion joint assembly
5.59 Ceiling expansion joint assembly
5.60 Wall to ceiling expansion joint assembly
5.61 Ceiling to ceiling expansion joint assembly
5.62 7/8" Hat channel
5.64 Standing seam metal clip
5.66 Box header at all opening over 4'- 0" wide, combined with deflection track where needed
5.67 Prefinished break metal to match adjacent hollow metal frame
5.68 Secure with structure to existing; field verify
5.69 Bracing as required
5.70 5/8" thick aluminum monument panel; powder coated paint finish

Division 6 - Woods and Plastics

6.01 3/4" plywood, painted; re: Finish schedule
6.02 4' x 8' x 3/4" fire resistant plywood, painted, fire-rating to remain exposed and visible; re: Electrical and Finish schedule
6.03 4' x 4' x 3/4" fire resistant plywood, painted, fire-rating to remain exposed and visible; re: Electrical and Finish schedule
6.04 3/4" stain grade hardwood plywood
6.05 3/4" marine grade plywood
6.06 1/4" plywood back panel
6.07 Plywood sheathing
6.08 Treated wood blocking as required
6.09 1" x treated blocking, continuous
6.10 2" x treated wood blocking, continuous
6.11 2" x 8" treated continuous blocking
6.12 2" x 4" treated continuous blocking
6.13 1" x 4" treated continuous blocking
6.14 Shim as required
6.15 8" x 8" wood column, re: Structural
6.16 Wood joist; re: Structural
6.17 Treated wood purlin, stained; re: Structural & Finish Schedule
6.18 Finish grade wood base, re: Finish Schedule for wood, size, and finish
6.19 Solid wood base, re: Finish Schedule for wood, size, and finish
6.20 1" x 2-1/2" finish grade wood trim, painted; re: Finish Schedule
6.21 1" x paint grade wood trim, painted; re: Finish Schedule
6.22 Millwork; re: Millwork details
6.23 Base cabinets; re: Millwork details
6.24 Wall cabinets; re: Millwork details
6.25 Tall cabinets; re: Millwork details
6.26 Recycling cabinets
6.27 Instruction station; re: Millwork details
6.28 Reception desk; re: Millwork details
6.29 Half bullnose edge, stained. re: Millwork details
6.30 Wood handrail, stained. GC to provide required blocking in wall
6.31 Wood bench, stained
6.32 Shelving, GC to provide required blocking in wall
6.33 Shelf with coat rod. GC to provide required blocking in wall
6.34 Cabinet lock
6.35 2" vinyl grommet
6.36 24" x 24" Stainless Steel Access panel
6.37 Miter edges
6.38 Plastic laminate sill
6.39 Countertop; re: Millwork details & Finish schedule
6.40 Platform millwork; re: Millwork details
6.41 Open shelving millwork; re: Millwork details
6.42 Granite countertop and backsplash
6.43 Hardi-plank lap siding, painted; re: Finish schedule
6.44 Hardi-trim 6" wide; re: Finish schedule
6.45 Hardi-trim 4" wide; re: Finish schedule
6.46 Hardi-panel siding; re: Finish schedule
6.47 Hardi-soffit panel; re: Finish schedule
6.48 3Form panel divider supported by 3Form system
6.49 Backsplash; re: Finish schedule
6.50 MDF
6.51 Continuous sheet metal strapping, re: Specifications
6.52 Continuous fiber cant strip
6.53 Continuous wood cant strip
6.54 1" plywood
6.55 2 x wood slat wall; re: Finish Schedule
6.56 Desk - Furniture Owner Provided Owner Installed
6.57 1/2" Plywood back panel

Division 7 - Thermal & Moisture Protection

7.01 Flat roof roofing system, re: Specifications
7.02 Built-up roofing membrane, re: Specifications
7.03 Flexible sheet roofing system, re: Specifications
7.04 Metal roof roofing system, re: Specifications
7.05 Standing seam metal roof on polyisocyanurate insulation board
7.06 Asphalt shingle roofing system, re: Specifications
7.07 Underlayment
7.08 Below grade waterproofing
7.09 Dampproofing
7.10 Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
7.11 Rigid board insulation, re: Specifications
7.12 3 1/2" Polyisocyanurate rigid board
7.13 Insulation protective board
7.14 New concealed cast iron gutter and drain with membrane liner
7.15 Metal wall panel; re: Finish Schedule
7.16 1/2" Denglass sheathing
7.17 Roof hatch, re: Specifications
7.18 Skylight, re: Specifications
7.19 Metal coping, re: Finish Schedule
7.20 Prefinished metal coping at parapet cap, re: Finish Schedule
7.21 Parapet wall covering
7.22 Cap fascia
7.23 Prefinished Metal Fascia
7.24 Metal roof trim
7.25 Metal cleat
7.26 Through wall metal scupper
7.27 Conductor head
7.28 6' Gutter, brackets, and spacers; install per manufacturer's requirements and recommendations
7.29 6" Downspout and support hangers; install per manufacturer's requirements and recommendations
7.30 Integral canopy downspout by canopy provider
7.31 Metal downspout boot to connect to underground storm system, finish to match downspout
7.32 Concrete splash block
7.33 Fry Reglet "Springlok" flashing system
7.34 Counter flashing
7.35 Base flashing
7.36 Metal trim flashing
7.37 Roof flashing
7.38 Through-wall flashing
7.39 Membrane flashing
7.40 Roof penetration flashing
7.41 Headwall flashing
7.42 Floating ridge cap
7.43 Breather vents
7.44 Pitch pocket
7.45 Sealant
7.46 Backer rod and sealant
7.47 Backer rod
7.48 Bond breaker
7.49 Steel mesh, galvanized
7.50 1" cap joint
7.51 1" expansion joint w/ compressible filler
7.52 Roof expansion joint cover
7.53 Joint cover plate
7.54 Draft stop
7.55 Cementitious fireproofing
7.56 Firestopping
7.58 Fluid applied air and water barrier
7.59 Self-adhered air and water barrier
7.60 1/2" Gypsum sheathing
7.61 J-trim
7.62 Roof hugger subframe
7.63 Standing seam knee/rib cover
7.64 J-trim with weeps
7.65 Debris/insect guard
7.66 Standing seam clamp
7.67 Prefinished metal bronze downspout nozzle

Division 8 - Openings

8.01 Scheduled door; Re: Door schedule
8.02 Scheduled door frame
8.03 Overhead coiling door, manual
8.04 Overhead coiling door, elec.
8.05 Overhead sectional door, manual
8.06 Overhead sectional door, elec.
8.07 Sliding door, re: Door schedule
8.08 Tubular daylighting device, interior diffuser to be coordinated with ceiling finish
8.09 Fire shutter
8.10 Scheduled window, re: Window schedule
8.11 Scheduled window frame, re: Window Schedule
8.12 Scheduled window frame set in full bed of butyl sealant; re: Window Schedule
8.13 Scheduled glazing system, re: Window schedule
8.14 Vertical sliding service window
8.15 Horizontal sliding service window
8.16 Door louver
8.17 Knox box, re: Specifications
8.18 Access door w/ lock and piano hinge; painted to match wall/ceiling unless noted otherwise
8.19 2'-0" x 2'-0" stainless steel plumbing access panel
8.20 Overhead coiling grille, manual
8.21 Overhead coiling grille, elec.
8.22 Door jamb, re: Door Schedule and General Notes
8.23 Vertical mullion, re: Frame Schedule
8.24 Horizontal mullion, re: Frame Schedule
8.25 Frame anchor
8.26 Floor anchor
8.27 Mounting clip
8.28 Continuous J clip
8.29 Saddle
8.30 Sill pan w/ end dams set in full bed of butyl sealant
8.31 Sill track
8.32 Head track
8.33 Polycarbonate sheet, re: Specifications
8.34 Existing window
8.35 Existing door
8.36 Existing louver to remain
8.37 Storefront/wall assembly; re: Elevations

Division 9 - Finishes

9.01 1-5/8" metal studs at 16' O.C. Maximum
9.02 2-1/2" metal studs at 16" O.C. Maximum
9.03 3-5/8" metal studs at 16" O.C. Maximum
9.04 4" metal studs at 16" O.C. Maximum
9.05 6" metal studs at 16" O.C. Maximum
9.06 6" exterior wall metal studs at 16" O.C. Maximum
9.07 Top runner
9.08 Bottom runner
9.09 Metal stud bracing at 48" O.C. maximum, re: Framing Notes
9.10 Double studs at jamb conditions, typical
9.11 1-3/8" x 7/8" metal angle
9.12 2-1/2' x 2-1/2" metal angle
9.13 Cold-rolled channel, 3/4" with 1/2" flanges
9.14 Cold-rolled channel, 1-1/2" with 17/32" flanges
9.15 Cold-rolled channel, 2" with 17/32" flanges
9.16 Resilient channel
9.17 Metal furring channel
9.18 1" Z-furring channel
9.19 1-1/2" Z-furring channel
9.20 2" Z-furring channel
9.21 3" Z-furring channel
9.22 3/4" cross furring channel
9.23 1-1/2" main runner channel
9.24 1/4" gypsum board
9.25 1/2" gypsum board
9.26 5/8" gypsum board
9.27 5/8" water-resistant Type X gypsum board
9.28 5/8" abuse-resistant gypsum board
9.29 5/8" gypsum board backing board

Division 9 - Finishes

9.30 1/2" gypsum sheathing
9.31 5/8" cementitious backer board
9.32 Sound attenuation batts; depth of batts to match depth of wall stud, unless noted otherwise
9.33 Acoustical sealant
9.34 Corner bead
9.35 J-trim
9.36 L-trim
9.37 Shadow molding
9.38 Reveal, painted
9.39 Control joint, re: gypsum board installation requirements and recommendations
9.40 Control joint
9.41 Expansion Joint
9.42 Carpet, re: Finish schedule
9.43 Floor tile, re: Finish schedule
9.44 Ceramic tile, re: Finish schedule
9.45 Paver system; re: Finish Schedule
9.46 Epoxy flooring, re: Finish schedule
9.47 Terrazzo, re: Finish schedule
9.48 Slip-resistant liquid floor coating, re: Finish schedule
9.49 Slip resistant sheet vinyl floor covering, re: Finish schedule
9.50 Wood flooring system, re: Finish schedule
9.51 Modular tile sports flooring
9.52 Rubber flooring system, re: Finish schedule
9.53 Resilient base, re: Finish schedule
9.54 Resilient base, re: Finish schedule
9.55 Tile base, re: Finish schedule
9.56 Wood base, re: Finish schedule
9.57 Epoxy base, re: Finish schedule
9.58 Paint, re: Finish schedule
9.59 Wall tile, re: Finish schedule
9.60 Acoustic wall panel(s), re: Finish schedule
9.61 Vinyl wall covering, re: Finish schedule
9.62 Gypsum board ceiling
9.63 Gypsum board furdown
9.64 Suspended acoustic ceiling tile and grid system, re: Finish schedule
9.65 Perforated metal ceiling assembly system, re: Finish schedule
9.66 Start point for scheduled ceiling grid
9.67 Hanger wire
9.68 Tie wire
9.69 Countertop with matching 4" backsplash unless noted otherwise, re: Finish schedule
9.70 Plaster, re: Finish schedule and Specifications for depth
9.71 Metal lath
9.72 Casing bead
9.73 Drip screed, plain
9.74 Drip screed, vented
9.75 Drip groove
9.78 Uplift bracing, re: Structural
9.79 Mortar bed
9.80 Underlayment
9.81 Vapor barrier
9.82 Vented base
9.83 Sleepers
9.84 Pads
9.85 Reducer strip
9.86 Floor transitions
9.87 Game striping paint, re: Finish schedule
9.88 Scheduled partition; re: Partition types
9.89 Existing wall; Field verify
9.90 Caulk both sides
9.91 Paint applied stops
9.92 Boxed metal stud
9.94 Scheduled stucco soffit; re: Finish schedule
9.95 Scheduled stucco wall; re: Finish schedule
9.96 Scheduled flooring; re: Finish schedule

Division 10 - Specialties

10.01 Toilet partition(s) , re: Accessory schedule
10.02 Urinal screen, re: Accessory schedule
10.03 Paper towel dispenser, re: Accessory schedule
10.04 Toilet paper dispenser, re: Accessory schedule
10.05 Soap dispenser, re: Accessory schedule
10.06 Grab bar, 42" long, re: Accessory schedule
10.07 Grab bar, 36" long, re: Accessory schedule
10.08 Grab bar at shower, re: Accessory schedule
10.09 Continuous ADA grab bar, re: Accessory schedule
10.10 Framed mirror, 24" x 36", re: Accessory schedule
10.11 Framed mirror, 24" x 60", re: Accessory schedule
10.12 Unframed mirror, re: Accessory schedule
10.13 Sanitary napkin dispenser, re: Accessory schedule
10.14 Sanitary napkin disposal, re: Accessory schedule
10.15 Shower partitions, re: Accessory schedule
10.16 Shower rod, curtain & hooks, re: Accessory schedule
10.17 Robe hook, re: Accessory schedule
10.18 Coat hook, re: Accessory schedule
10.19 Folding shower seat, re: Accessory schedule
10.20 Recessed soap dish, re: Accessory schedule
10.21 Electrical hand dryer, re: Accessory schedule
10.22 Electrical hair dryer, re: Accessory schedule
10.23 Baby changing station, re: Accessory schedule
10.24 Mop rack, re: Accessory schedule
10.25 T.V. ceiling mount, re: Accessory schedule
10.26 T.V. wall mount, re: Accessory schedule
10.27 Mounting angles
10.28 Corner guard(s)
10.29 Fire extinguisher cabinet (FEC), recessed; re: Specifications for finish and labeling
10.30 Wall-hung fire extinguisher (FE)
10.31 Recessed shelf standard
10.32 Aluminum Canopy and required structural support(s), connections, flashing, and components - to be permitted separately by contractor, re: Specifications
10.33 Canopy deck
10.34 Canopy fascia
10.35 Canopy frame
10.36 Canopy flashing
10.37 Canopy support
10.38 Wire mesh partition(s)
10.39 Folding panel partition, manual
10.40 Folding panel partition, electric
10.41 Accordion folding partition, manual
10.42 Accordion folding partition, electrical
10.43 Operable partition track
10.44 Operable partition head trim
10.45 Metal shelving, re: Equipment schedule
10.46 Prefinished wall louver
10.47 Insect screen
10.48 Mounting angles
10.49 Corner guard(s)
10.50 Flagpole(s)
10.51 Building identification letters, re: Graphics Schedule and Specifications
10.52 Aluminum address post with signage, GC to provide structure; install per manufacturer s requirements and recommendations
10.53 Signage, GC to provide foundation support (site signage) and blocking (interior signage) where required. Signage on glass shall have additional piece on other side concealing back of signage, re: Graphics Schedule
10.54 Occupancy sign; re: Graphics Schedule
10.55 Bldg. plaque(s); re: Graphics Schedule
10.56 Building dedication plaque, O.P.C.I.
10.57 Vinyl graphics, GC to ensure Level 5 finish and smooth finish at each location, re: Graphics Schedule
10.58 Lockers, re: Equipment schedule
10.59 Locker filler panel/trim
10.60 Existing lockers, new location; GC to provide matching filler panels where needed
10.61 Bench, re: Equipment schedule
10.62 Markerboard, re: Equipment schedule
10.63 Tackboard, re: Equipment schedule
10.64 Mailboxes, re: Equipment schedule and Specifications
10.65 Surface mounted waste receptacle, re: Toilet Accessories Schedule
10.66 Room signage; re: Signage schedule and Door schedule
10.67 1" deep channel letters with 316 brushed stainless-steel face and sides; mounted 1.5" standoff spacers fastened to the monument sign aluminum panel. letters to have clear Lexan / Polycarbonate backing

Division 11 - Equipment

11.01 Front curtain
11.02 Valance
11.03 Border
11.04 Leg
11.05 Rear curtain
11.06 Dish washer
11.07 Refrigerator - Owner Provided Contractor Installed
11.08 Under counter refrigerator
11.09 Ice Maker
11.10 Drop-in range

Division 11 - Equipment

11.11 Range hood
11.12 Oven with Cooktop
11.13 Microwave
11.14 Disposal
11.15 Washer-Owner Provided Contractor Installed
11.16 Dryer - Owner Provided Contractor Installed
11.17 Wall-hung, electric projection screen
11.18 Ceiling-hung, electric projection screen
11.19 Wall-hung, manual projection screen
11.20 Ceiling-hung, manual projection screen
11.21 Vending machine(s)
11.22 Recessed defibrillator cabinet
11.23 Wall-mounted flat panel television
11.24 Exterior scoreboard, GC to coordinate power and data end points with Owner requirements/needs
11.25 Interior scoreboard, GC to coordinate power and data end points with Owner requirements/needs
11.26 Exterior backstop
11.27 Fixed backstop
11.28 Backstop, forward fold, electrical operation
11.29 Backstop, forward fold, manual
11.30 Volleyball floor insert
11.31 Football goal post, pre-finished
11.32 Roll down divider, electrical
11.33 Wall padding
11.34 Small dumpster (6 yard)
11.35 Large dumpster (40 yard)

Division 12 - Furnishings

12.01 Base casework
12.02 Wall casework
12.03 Tall casework
12.04 Mobile casework
12.05 Millwork
12.06 Instructor's table, re: Furniture Schedule
12.07 Lock
12.08 Horizontal louver blinds, re: Specifications
12.09 Shades, mechanical; GC to provide power and coordinate switch location(s) with Owner
12.10 Shades, manual
12.11 Work station, re: Furniture Schedule
12.12 Office furniture, re: Furniture Schedule

Division 13 - Special Construction

13.01 Metal building system to be permitted separately by contractor; GC to provide structural design, reactions, and anchor bolt engineering for entire system
13.02 Grandstands
13.03 Bleachers, mechanical
13.04 Bleachers, manual

Division 14 - Conveying Systems

14.01 Elevator
14.02 Wheelchair lift
14.03 Overhead cranes
14.04 Crane; Division, by Others; O.P.C.I.
14.05 Jib-Crane; re: Structural

Division 22 - Plumbing

22.01 Wall-mount lavatory; re: Plumbing
22.02 Counter-mount lavatory; re: Plumbing
22.03 Single-compartment undermount sink; re: Plumbing
22.04 Two-compartment sink; re: Plumbing
22.05 Wash fountain; re: Plumbing
22.06 Service sink; re: Plumbing
22.07 Mop sink; re: Plumbing
22.08 Wall-mount water closet; re: Plumbing
22.09 Floor-mount water closet; re: Plumbing
22.10 Urinal; re: Plumbing
22.11 Electric water cooler; re: Plumbing
22.12 Bi-level electric water cooler; re: Plumbing
22.13 Prefabricated shower unit; re: Plumbing
22.14 Shower head and controls; re: Plumbing
22.15 Floor drain; re: Plumbing
22.16 Floor sink; re: Plumbing
22.17 Roof drain; re: Plumbing
22.18 Overflow drain; re: Plumbing
22.19 Hose bibb; re: Plumbing
22.20 Freeze-proof hose bibb; re: Plumbing
22.21 Wall hydrant; re: Plumbing
22.22 Floor cleanout; re: Plumbing
22.23 Emergency eyewash; re: Plumbing
22.24 Emergency shower/eyewash; re: Plumbing
22.25 Water heater; re: Plumbing
22.26 Instantaneous undercounter water heater; re: Plumbing
22.27 Water softener; re: Plumbing
22.28 Roof vent; re: Plumbing
22.29 NOT USED
22.30 Fire sprinkler head by General Contractor; RE: Plumbing for general notes
22.31 Fire sprinkler system; RE: Plumbing for general notes

Division 23 - Mechanical

23.01 Relocated R.T.U. re: Mechanical
23.02 Air handling unit; re: Mechanical
23.03 Fan coil unit; re: Mechanical
23.04 Condensing unit; re: Mechanical
23.05 Rooftop unit; re: Mechanical
23.06 Chiller; re: Mechanical
23.07 Boiler; re: Mechanical
23.08 Exhaust fan; re: Mechanical
23.09 Supply fan; re: Mechanical
23.10 Outside air intake; re: Mechanical
23.11 Ductwork; re: Mechanical
23.12 Exposed ductwork to be painted; re: Specifications
23.13 Supply air grille; re: Mechanical
23.14 Return air grille; re: Mechanical
23.15 Exhaust air grille; re: Mechanical
23.16 Slot diffuser; re: Mechanical
23.17 Exterior louver; re: Mechanical
23.18 Prefabricated equipment curb; re: Mechanical
23.19 Kitchen vent hood; re: Mechanical
23.20 Kitchen equipment
23.21 Trench Drain

Division 25 - Electrical

25.01 Approximate location of electrical service connection and meter; re: Civil and Electrical
25.02 Transformer pole; re: Electrical
25.03 Pad-mounted transformer; re: Electrical
25.04 Floor-mounted transformer; re: Electrical
25.05 Suspended transformer; re: Electrical
25.06 Wall-mounted transformer; re: Electrical
25.07 Emergency generator; re: Electrical
25.08 Meter rack; re: Electrical
25.09 Electrical panel(s); re: Electrical
25.10 Scheduled light fixture re: Electrical
25.11 Floor data/power receptacles; re: Electrical
25.12 Coordinate location of floor/wall mounted receptacles with knee space locations; re: Millwork/Casework Elevations
25.13 Receptacles mounted above countertops/backsplashes are to be 42 above-finish-floor to centerline of cover plate and are to be installed horizontally, unless noted otherwise
25.14 Scoreboard receptacle; re: Electrical
25.15 Ceiling mounted data/power receptacles for projector; re: Electrical
25.16 Speaker; re: Electrical
25.17 Push button automatic door operator
25.18 Control switch for elec. projection screen
25.19 Control switch for mechanical door(s)/grille(s)
25.20 Security control panel
25.21 Fire alarm control panel; re: Electrical
25.22 Fire alarm remote annunciator panel; re: Electrical
25.23 Conductor cable lightning protection system

MASTER KEYNOTE LIST

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09/23/2024

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09/23/2024	100% CONSTRUCTION DOCUMENTS

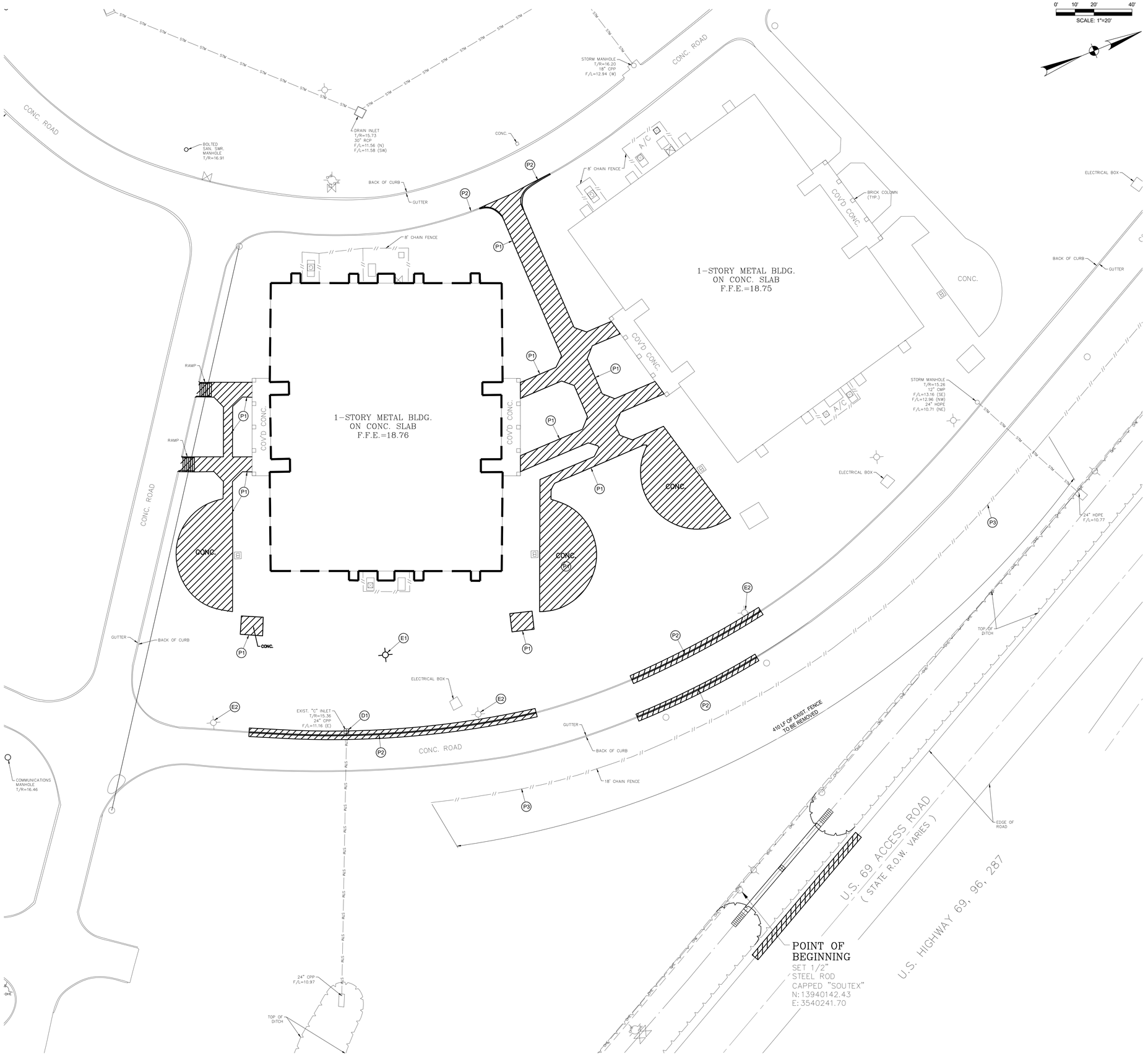
MASTER KEY NOTES

1. Reference this sheet if key note is missing from any following sheets.

Not all notes are used in this project

Scale: AS NOTED

G.051



DEMOLITION NOTES TO CONTRACTOR:

1. THE CONTRACTOR AND OWNER SHALL COORDINATE WITH UTILITY SERVICE PROVIDERS FOR TERMINATION OF POWER AND GAS SERVICES TO THE SITE OR NEW SERVICES. THIS WORK SHALL BE PERFORMED BY THE UTILITY SERVICE PROVIDER AND SHALL BE SCHEDULED AS ONE OF THE FIRST ITEMS OF BUSINESS.
2. ALL SITE FEATURES NOT IDENTIFIED TO BE DEMOLISHED ARE TO REMAIN AND SHALL BE PROTECTED-IN-PLACE.
3. ALL ITEMS DESIGNATED TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR.
4. CONTRACTOR TO FOLLOW ALL RECOMMENDED SAFETY AND DISPOSAL PROCEDURES INCLUDING BUT NOT LIMITED TO EPA, TCEQ & OSHA.
5. CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL DEBRIS OFFSITE.
6. BACKFILL ALL VOIDS FROM REMOVED ITEMS WITH STRUCTURAL FILL MATERIAL PLACED AND COMPACTED PER GEOTECHNICAL REPORT.
7. WHEN EXISTING SIDEWALK IS CLOSED FOR CONSTRUCTION, CONTRACTOR SHALL BARRICADE THAT AREA AND PROVIDE SAFE ALTERNATE PATH FOR PEDESTRIANS WITH PROPER SIGNAGE.
8. ALL TRAFFIC SIGNAGE WITHIN THE ROW SHALL BE PROTECTED IN PLACE AT ALL TIMES. ANY DAMAGE TO THESE DEVICES SHALL BE REPAIRED IMMEDIATELY.
9. CONTRACTOR SHALL REPAIR ANY ITEMS DAMAGED DURING CONSTRUCTION TO THEIR ORIGINAL CONDITION.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING POSITIVE DRAINAGE ON SITE DURING ALL CONSTRUCTION ACTIVITIES.
11. THE CONTRACTOR SHALL ENTER AND EXIT THE SITE THROUGH EXISTING DRIVEWAY.
12. CONTRACTOR SHALL NOTE ALL UTILITY PLUG LOCATIONS ON FIELD RECORD DRAWINGS.

SAWCUT NOTES:

1. SAWCUT 2" MINIMUM DEPTH, EXPOSE AND CLEAN EXISTING REINFORCING STEEL.
2. IF NO REINFORCING STEEL EXISTS, #5 HORIZONTAL DOWELS, 24" LONG, GRADE 60, SHALL BE DRILLED AND EMBEDDED 12" INTO THE CENTER OF EXISTING CONCRETE WITH EPOXY.
3. ALL REINFORCING STEEL SHALL BE PLACED 3" CLEAR (2" ABSOLUTE MINIMUM) FROM EDGE OF CONCRETE.

PAVING DEMOLITION KEY NOTES:

(P1) EXISTING CONCRETE PAVEMENT TO BE REMOVED.
(P2) EXISTING CONCRETE CURB TO BE REMOVED.
(P3) EXISTING FENCE TO BE REMOVED.

ELECTRICAL DEMOLITION KEY NOTES:

NOTE: ALL ELECTRICAL ITEMS TO BE CUT, PLUGGED OR REMOVED SHALL BE COORDINATED WITH SERVICE PROVIDER AND MEP.

(E1) EXISTING LIGHT POLE TO BE REMOVED.
(E2) EXISTING LIGHT POLE TO REMAIN.

DRAINAGE DEMOLITION KEY NOTES:

(D1) EXISTING TYPE "C" INLET TO BE REMOVED.

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DEMOLITION PLAN

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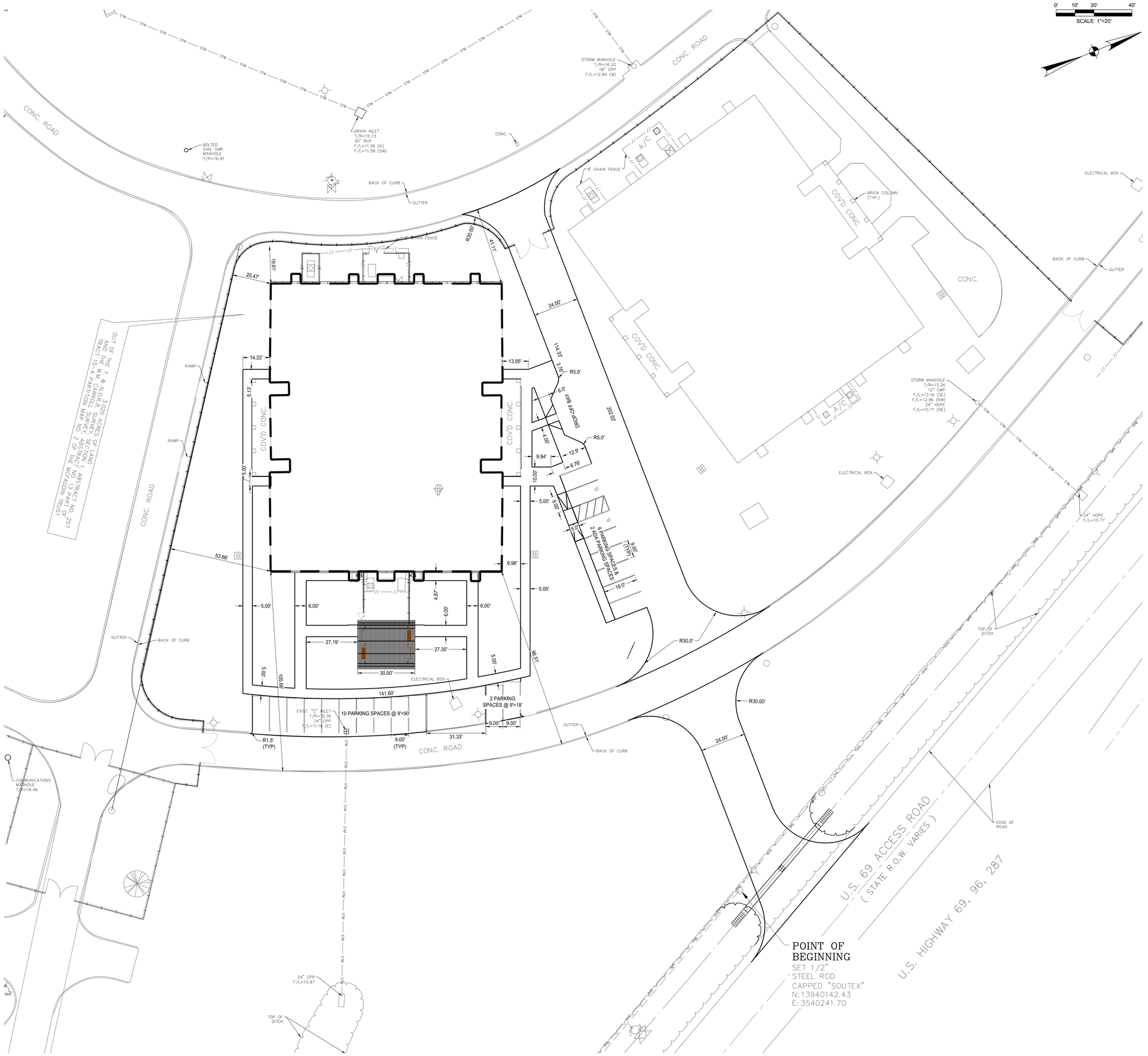

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2. CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES IN THE FIELD PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER IF DISCREPANCIES OCCUR.
3. THE LOCATION OF ALL UTILITIES PRESENTED ON THESE DRAWINGS IS SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.
4. CAUTION!!! THERE ARE OVERHEAD POWER LINES IN THE WORK AREA. CONTRACTOR SHALL FOLLOW CITY, STATE AND FEDERAL GUIDELINES WHEN WORKING AROUND EXISTING POWER LINES.
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10. ALL DISTURBED AREAS NOT TO BE PAVED OR LANDSCAPED SHALL BE SODDED UPON COMPLETION.

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LAYOUT PLAN

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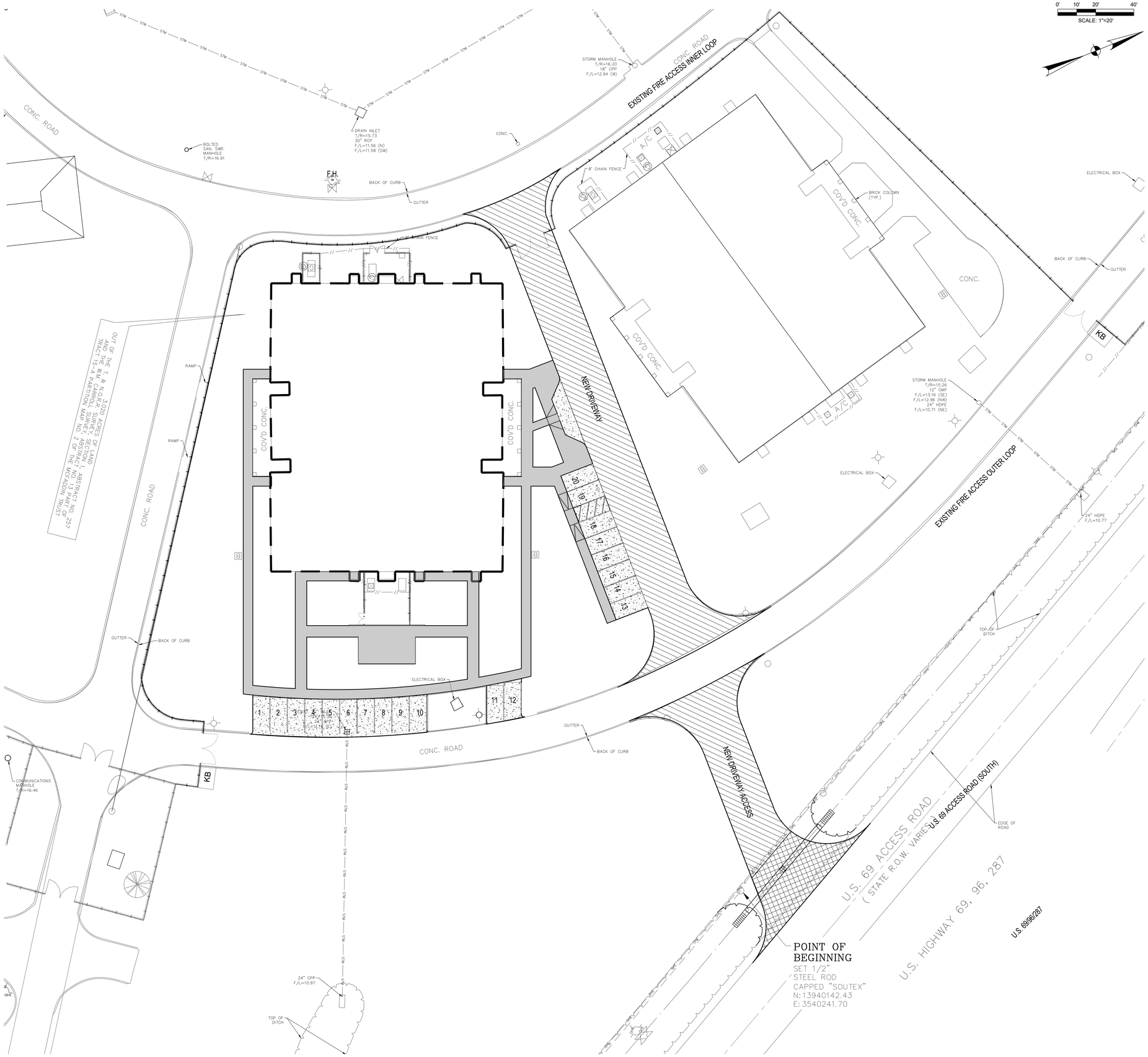

LEGEND	
	PROPOSED BUILDING RENOVATION
	5" CONCRETE SIDEWALK
	5" CONCRETE PAVEMENT
	6" CONCRETE PAVEMENT
	7" CONCRETE PAVEMENT

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6. SIDEWALKS SHALL HAVE A RUN SLOPE NO GREATER THAN 5% AND A CROSS SLOPE NO GREATER THAN 2%, UNLESS OTHERWISE NOTED.
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10. CONTRACTOR PERFORMING THE WORK SHALL BE RESPONSIBLE FOR SECURING ALL UTILITY PERMITS, PRIOR TO INSTALLATION OF ANY UTILITIES INCLUDING WATER, SEWER, ELECTRIC, CABLE TELEVISION AND GAS.

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PAVING PLAN

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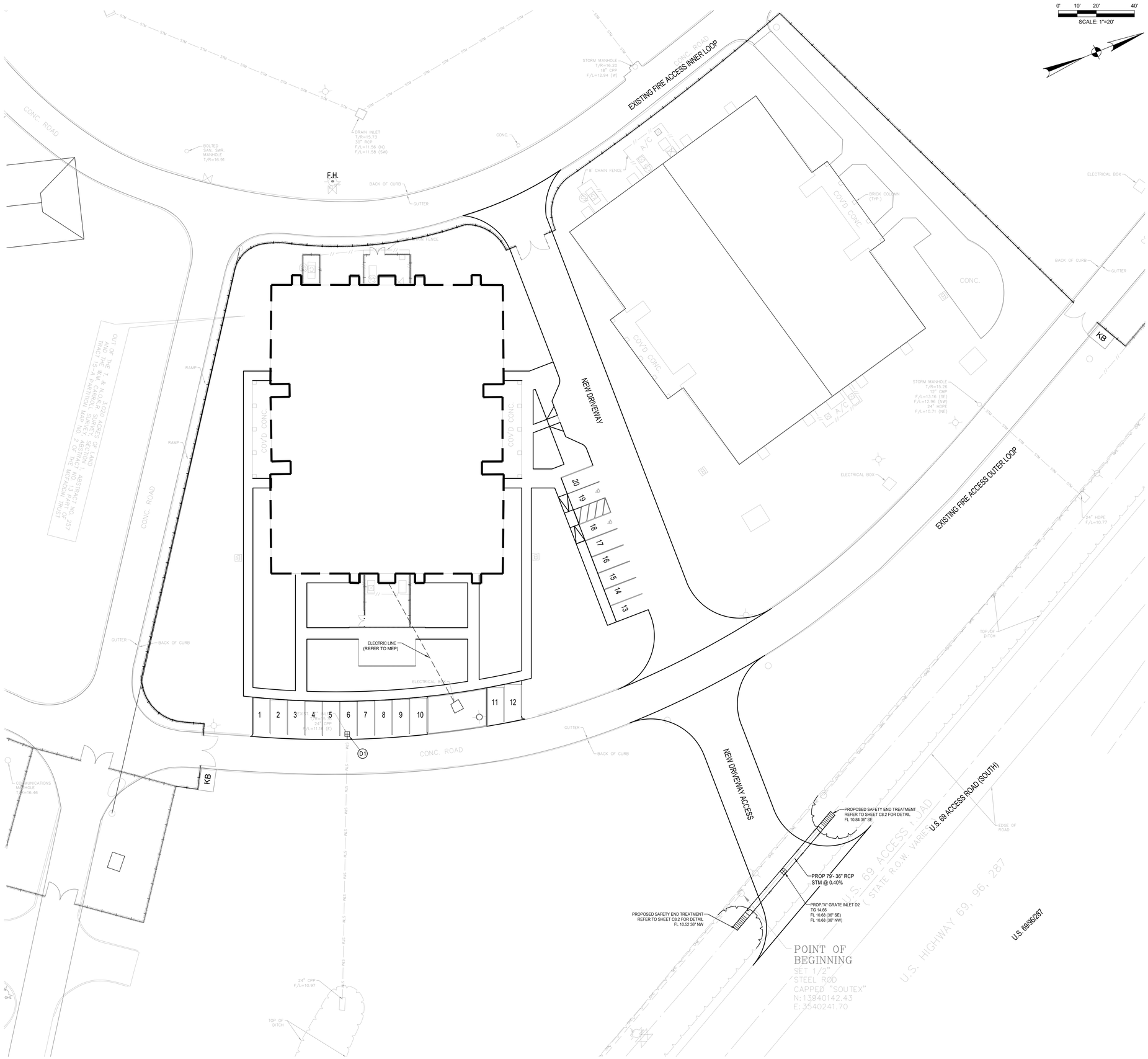

LEGEND

PROPOSED BUILDING LIMITS

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12. WATER AND SEWER MAINS SHALL BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH TCEQ RULES AND REGULATIONS.
13. CONTRACTOR PERFORMING THE WORK SHALL BE RESPONSIBLE FOR SECURING ALL UTILITY PERMITS, PRIOR TO INSTALLATION OF ANY UTILITIES INCLUDING WATER, SEWER, ELECTRIC, CABLE TELEVISION AND GAS.
14. DOMESTIC WATER LINES LESS THAN 4" IN DIAMETER SHALL BE SCH 40 PVC AND HAVE A MINIMUM COVER OF 2 FEET. DOMESTIC WATER LINES 4" DIAMETER AND LARGER SHALL BE AWWA C-900 DR 14 PVC AND HAVE A MINIMUM COVER OF 4 FEET.
15. FIRE WATER SERVICE SHALL BE C-900 SELF-EXTINGUISHING PVC PIPE THAT BEARS UNDERWRITERS' LABORATORIES MARK OF APPROVAL AND IS ACCEPTABLE WITHOUT PENALTY TO TEXAS STATE FIRE INSURANCE COMMITTEE AND HAVE A MINIMUM COVER OF 4 FEET.
16. SANITARY SEWER PIPE SIZES 6 INCHES AND SMALLER SHALL BE PVC SCHEDULE 40, AND PIPE SIZES 8 INCHES OR LARGER MAY BE SDR 35.
17. ALL STORM AND SANITARY SEWER CLEANOUTS SHALL HAVE TRAFFIC-RATED LIDS. CLEANOUTS LOCATED OUTSIDE OF PAVED AREAS SHALL HAVE 18" DIAMETER X 6" THICK REINFORCED CONCRETE PAD WITH TOP OF PAD MATCHING FINISHED GRADE.
18. ALL STORM SEWER PIPE SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) UNLESS OTHERWISE NOTED.

DRAINAGE KEY NOTES:

(D1) REMOVE MH TOP AND REPLACE WITH TYPE "A" GRATE TOP.

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PROFESSIONAL ENGINEER
09/23/2024

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UTILITY PLAN

Scale: AS NOTED

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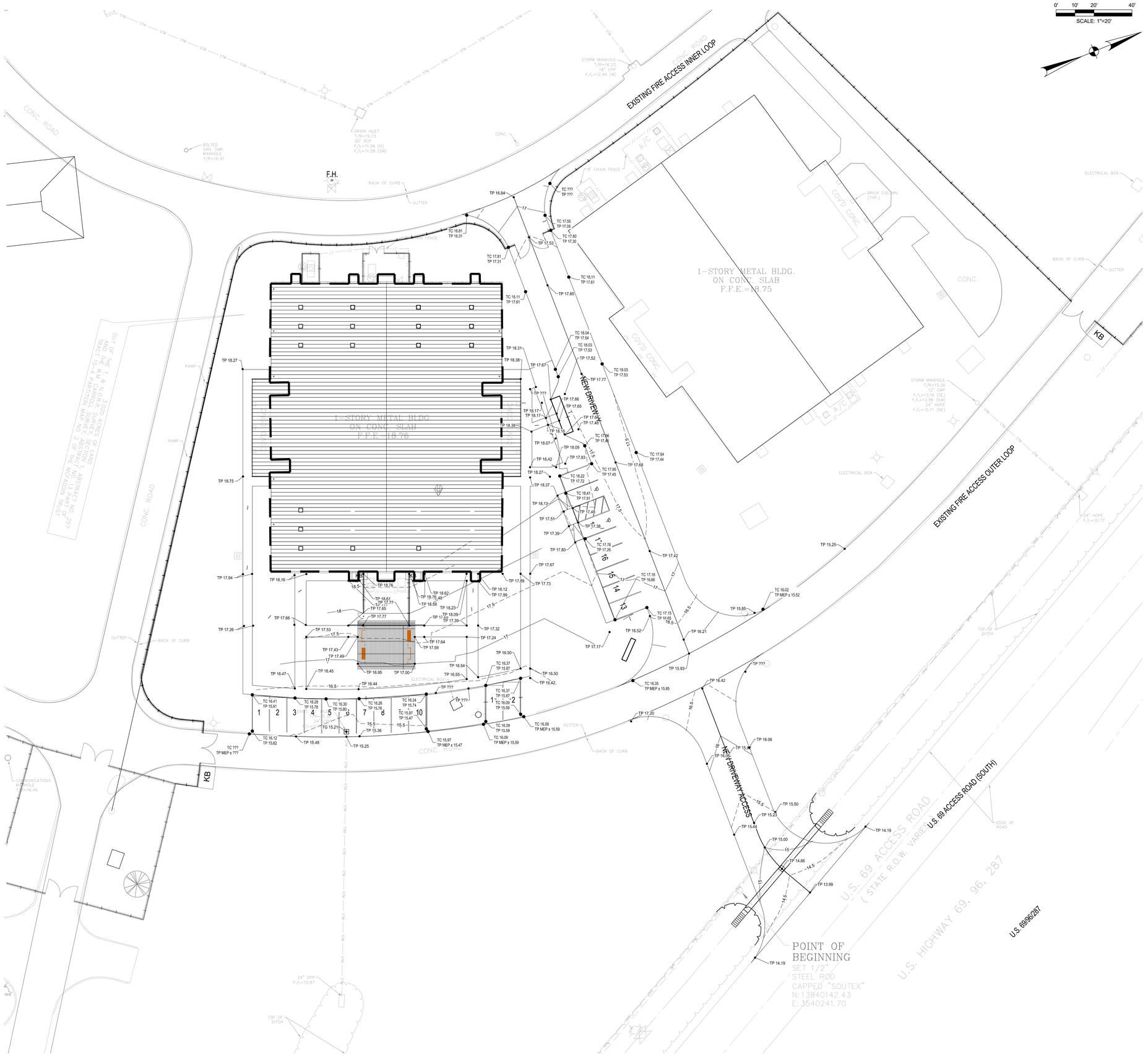

LEGEND	
	PROPOSED BUILDING RENOVATION
FFE	FINISHED FLOOR ELEVATION
MEP	MATCH EXISTING PAVEMENT
TG	TOP OF GRATE
TP	TOP OF PAVEMENT

GENERAL CONSTRUCTION NOTES:

1. ALL UNDERGROUND UTILITIES SHOWN ARE NOT GUARANTEED TO BE COMPLETE OR DEFINITE, BUT WERE OBTAINED FROM THE BEST INFORMATION AVAILABLE.
2. CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES IN THE FIELD PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER IF DISCREPANCIES OCCUR.
3. THE LOCATION OF ALL UTILITIES PRESENTED ON THESE DRAWINGS IS SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.
4. CAUTION!!! THERE ARE OVERHEAD POWER LINES IN THE WORK AREA. CONTRACTOR SHALL FOLLOW CITY, STATE AND FEDERAL GUIDELINES WHEN WORKING AROUND EXISTING POWER LINES.
5. SIDEWALKS SHALL HAVE RUN SLOPE NO GREATER THAT 5% AND A CROSS SLOPE NO GREATER THAN 2%, UNLESS OTHERWISE NOTED.
6. ALL DIMENSIONS ARE TO FACE OF CURB OR EDGE OF PAVEMENT UNLESS OTHERWISE NOTED.
7. ALL DIMENSIONS ARE PERPENDICULAR OR PARALLEL TO THEIR RESPECTIVE PROPERTY LINES UNLESS OTHERWISE NOTED.
8. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR BUILDING DIMENSIONS.
9. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL COORDINATE STAGING AND TRAFFIC CONTROL PLANS WITH OWNER.
10. ALL DISTURBED AREAS NOT TO BE PAVED OR LANDSCAPED SHALL BE SODDED UPON COMPLETION.

JEFFERSON COUNTY DIVERSION CENTER RENOVATION

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GRADING PLAN

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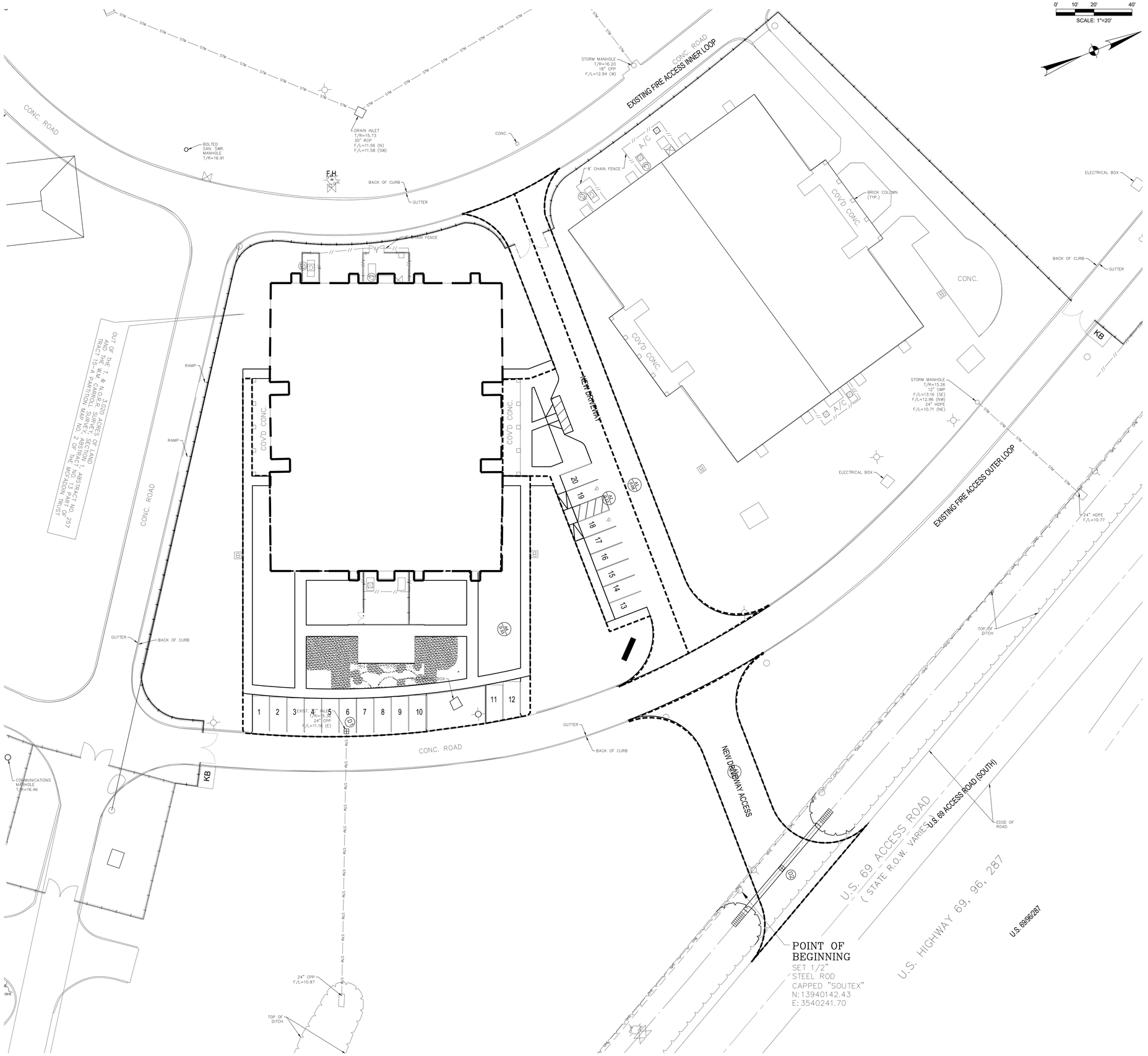

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90904
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PROFESSIONAL
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DRAINAGE AREA MAP

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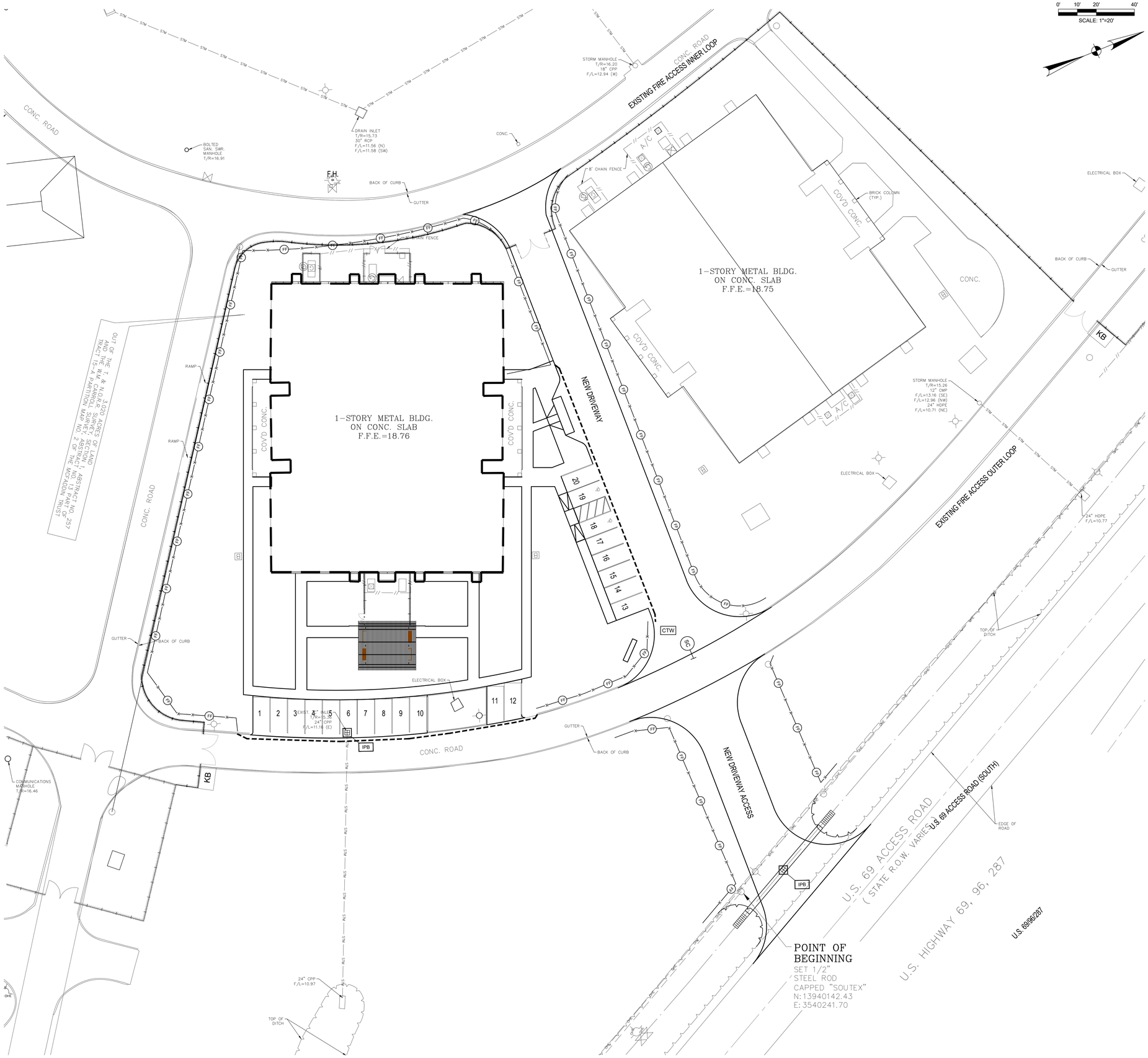

LEGEND

- PROPOSED BUILDING RENOVATION
- IPB II — INLET PROTECTION BARRIER (TYPE 2)
- FF — FILTER FABRIC FENCE
- SILT SOCK
- SC — STABILIZED CONSTRUCTION ACCESS
- CTW — CONCRETE TRUCK WASHOUT

GENERAL CONSTRUCTION NOTES

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6. ALL DISTURBED AREAS SHALL BE SODDED UPON COMPLETION IF NOT TO BE PAVED OR LANDSCAPED.
7. CONTRACTOR SHALL UTILIZE TEMPORARY EROSION CONTROL MAT OR EQUAL DURING CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR ENSURING WATER QUALITY CONTROLS MEET TCEQ STANDARDS.

SWPPP CONSTRUCTION NOTES :

1. ALL AREAS WHERE EXISTING VEGETATION AND GRASS COVER HAVE BEEN BARED BY CONSTRUCTION SHALL BE ADEQUATELY BLOCK SODDED OR HYDROMULCHED AND WATERED UNTIL GROWTH IS ESTABLISHED. IN DEVELOPED AREAS WHERE GRASS IS PRESENT, BLOCK SOD WILL BE REQUIRED. BARED AREAS SHALL BE SEEDED OR SODDED WITHIN 14 CALENDAR DAYS OF LAST DISTURBANCE.
2. APPROVED EROSION CONTROL MEASURES MUST BE INSTALLED DURING THE ENTIRE TIME THAT EARTH HAS BEEN BARED BY CONSTRUCTION AND SHALL STAY IN PLACE UNTIL ACCEPTABLE VEGETATIVE GROWTH IS ESTABLISHED AFTER CONSTRUCTION IS COMPLETE AND THEN REMOVED BY CONTRACTOR.
3. ALL EROSION CONTROL MEASURES SHALL BE CLEANED AFTER EVERY RAIN.
4. CONTRACTOR SHALL ENTER AND EXIT SITE FROM EXISTING DRIVEWAY.

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SWPPP

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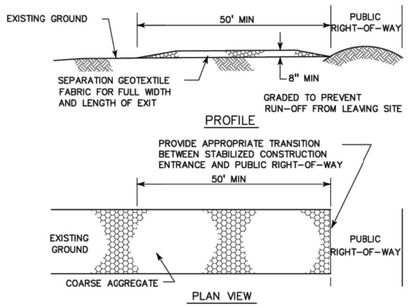
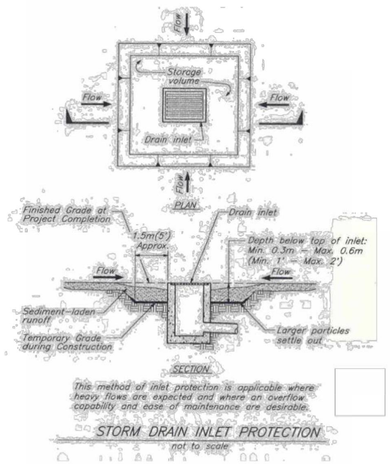


STABILIZED CONSTRUCTION EXIT

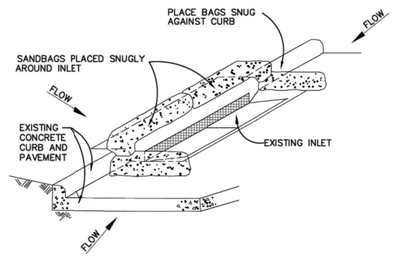
CONSTRUCTION NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN 50 FEET.
2. THICKNESS SHALL BE NOT LESS THAN 12 INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
4. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMMODATE A TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR THE TRUCK WASHING AREA.
6. STABILIZED CONSTRUCTION EXIT SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.
7. CONTRACTOR SHALL COORDINATE LOCATION WITH TAMU FPD.



STORM DRAIN INLET PROTECTION

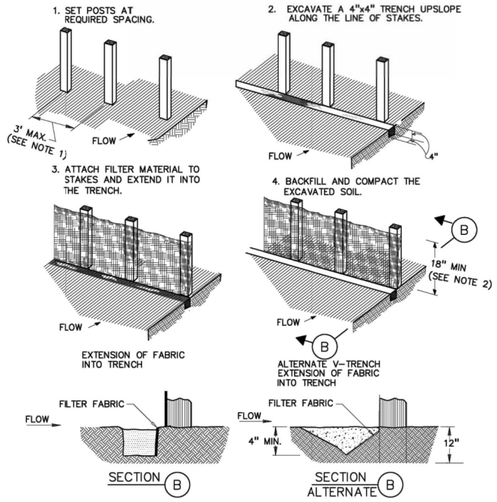
not to scale



GENERAL NOTES:

1. BAGS OR WATTLES CAN BE USED FOR THIS APPLICATION.
2. PROVIDE WOVEN OR UNWOVEN GEOTEXTILE FILTER FABRIC FOR BAGS.
3. PROVIDE COARSE SAND AND AGGREGATE MIX FOR FILL MATERIAL FOR BAGS. USE ONLY PARTICLES CONSISTING OF CLEAN, HARD, DURABLE MATERIALS FREE FROM ADHERENT COATINGS, SALT, ALKALI, DIRT, CLAY, LOAM, SHALE, SOFT OR FLAKY MATERIALS, OR ORGANIC AND INJURIOUS MATTER.
4. REMOVE SEDIMENT DEPOSIT WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-THIRD THE HEIGHT OF THE BARRIER.

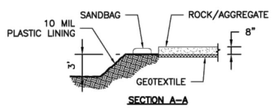
INLET PROTECTION BARRIERS FOR CURB INLETS

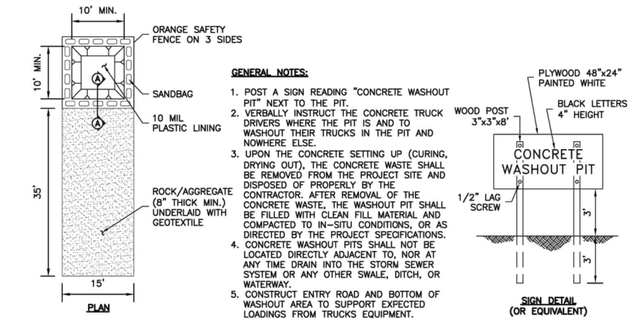


NOTES:

1. 2 INCH THICK BY 2 INCH WOODEN STAKES TO BE SET AT MAX. SPACING OF 3 FEET AND EMBEDDED A MIN. OF 8 INCHES. IF PREASSEMBLED FENCE WITH SUPPORT NETTING IS USED, SPACING OF POST MAY BE INCREASED TO 8 FEET MAX.
2. ATTACH FILTER FABRIC TO WOODEN STAKES. FILTER FABRIC FENCE SHALL HAVE A MIN. HEIGHT OF 18 INCHES AND MAX. HEIGHT OF 36 INCHES ABOVE NATURAL GROUND.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHOULD BE OVERLAPPED 6 INCHES AT THE POSTS, AND FOLDED.

FILTER FABRIC FENCE

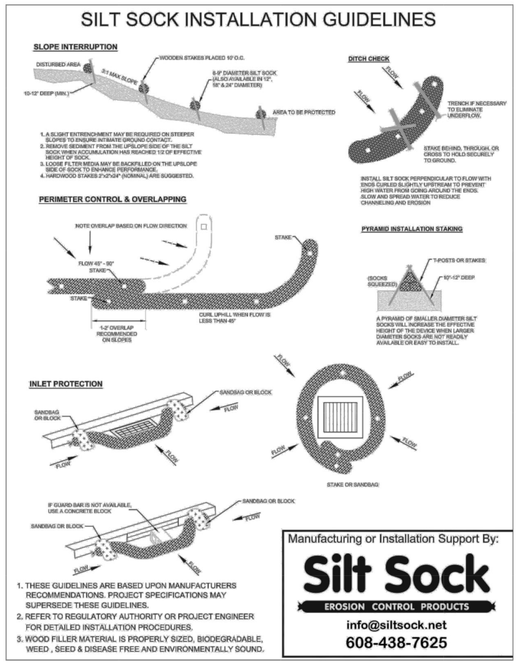


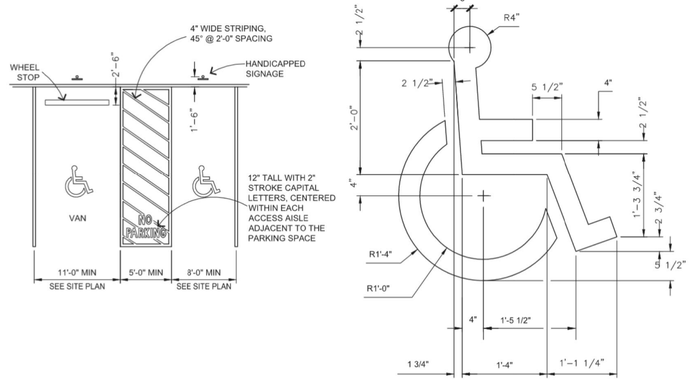


GENERAL NOTES:

1. POST A SIGN READING "CONCRETE WASHOUT PIT" NEXT TO THE PIT.
2. VERBALLY INSTRUCT THE CONCRETE TRUCK DRIVERS WHERE THE PIT IS AND TO WASHOUT THEIR TRUCKS IN THE PIT AND NOWHERE ELSE.
3. UPON THE CONCRETE SETTING UP (CURING, DRYING OUT), THE CONCRETE WASTE SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF PROPERLY BY THE CONTRACTOR. AFTER REMOVAL OF THE CONCRETE WASTE, THE WASHOUT PIT SHALL BE FILLED WITH CLEAN FILL MATERIAL AND COMPACTED TO IN-SITU CONDITIONS, OR AS DIRECTED BY THE PROJECT SPECIFICATIONS.
4. CONCRETE WASHOUT PITS SHALL NOT BE LOCATED DIRECTLY ADJACENT TO, NOR AT ANY TIME DRAIN INTO THE STORM SEWER SYSTEM OR ANY OTHER SWALE, DITCH, OR WATERWAY.
5. CONSTRUCT ENTRY ROAD AND BOTTOM OF WASHOUT AREA TO SUPPORT EXPECTED LOADINGS FROM TRUCKS EQUIPMENT.

CONCRETE TRUCK WASHOUT AREA

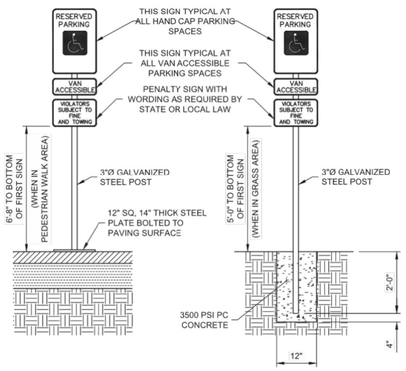




NOTES:
1. PAVEMENT PAINT, TRAFFIC COATING, ITEM 66, TYPE II.
2. BLUE COLOR TO MATCH TRAFFIC SIGNAGE BLUE

NOTES:
4" WIDE STRIPING MIN. PAVEMENT PAINT WHITE, ITEM 666, TYPE II

HANDICAP PARKING AND STRIPE DETAILS



ACCESSIBLE SIGN

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SITE DETAILS
SHEET 1 OF 2

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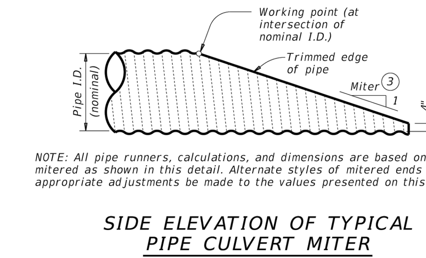
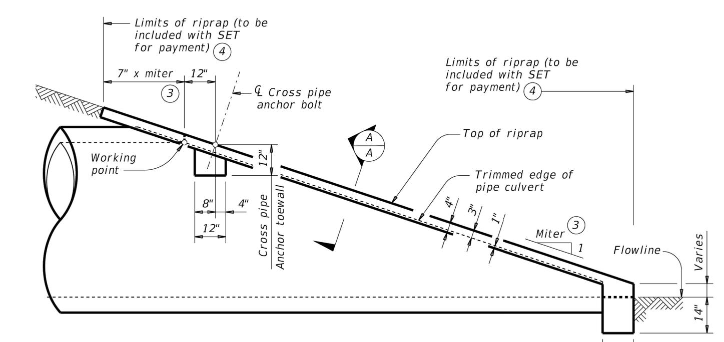


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

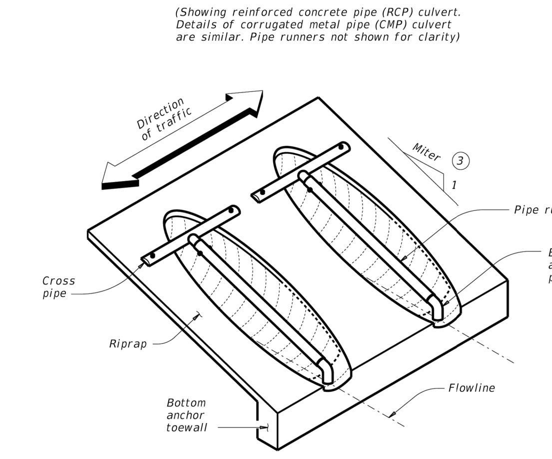
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ① ②

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length 3:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew	4:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew	6:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS ③

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED ②

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS ①

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' - 0"
4" STD	4.500"	4.026"	19' - 8"
5" STD	5.563"	5.047"	34' - 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤

Nominal Culvert I.D.	3:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew	4:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew	6:1 Side Slope 0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

① Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

② This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

③ Miter = slope of mitered end of pipe culvert.

④ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap."

⑤ Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT
FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: CD-SETP-CD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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REVISIONS	DIST	COUNTY		SHEET NO.

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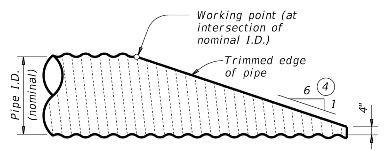
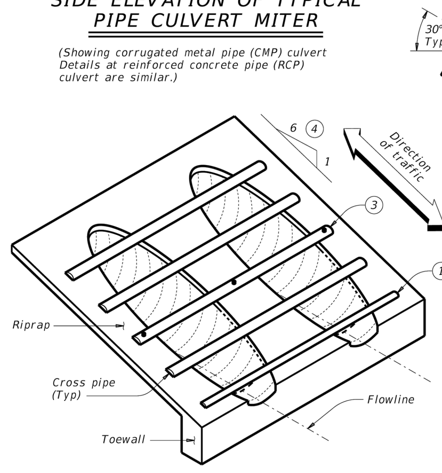


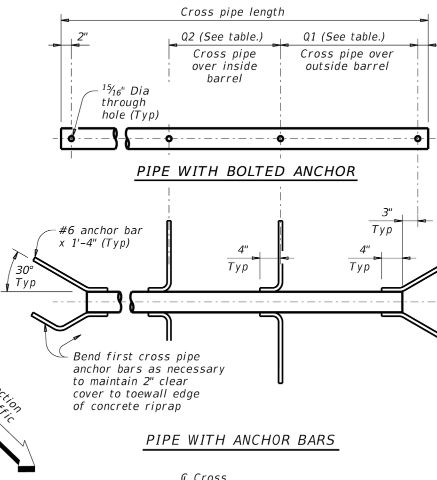
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

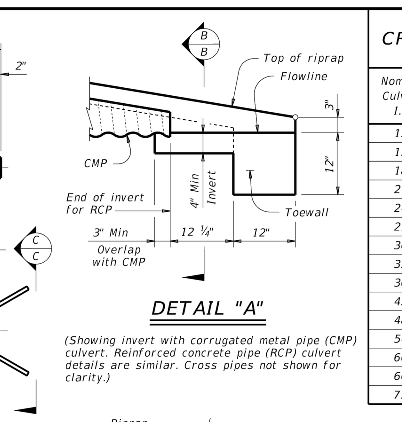
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

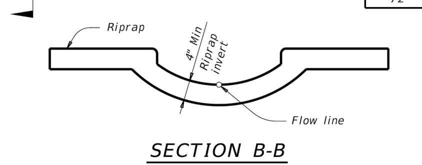


CROSS PIPE DETAILS



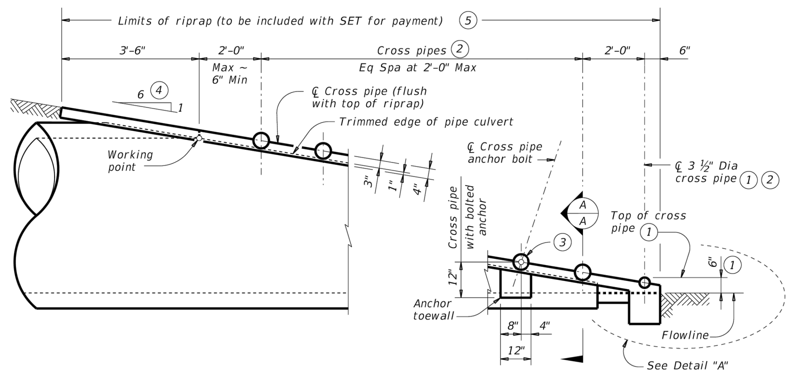
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



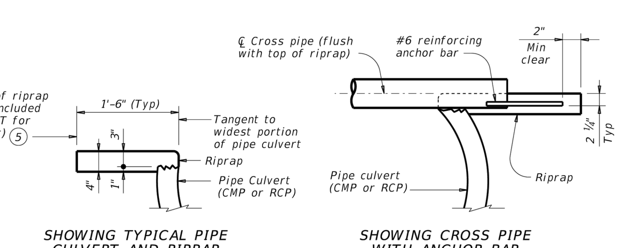
SECTION B-B

(Cross pipes not shown for clarity.)



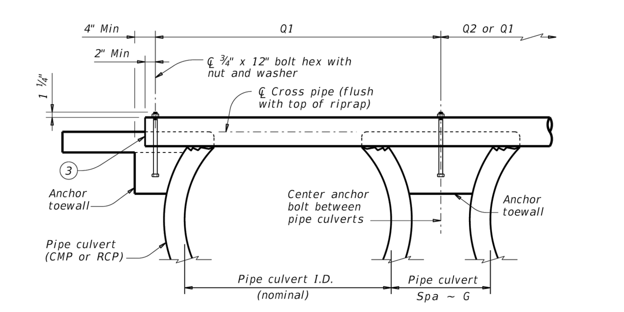
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES ②

Nominal Culvert I.D.	Conc Riprap (CY) ⑥	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

① The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

② Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

③ Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

④ Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

⑤ Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap."

⑥ Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."
Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT
FOR 12" DIA TO 72" DIA PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: CD-SETP-PD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.

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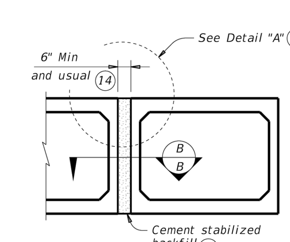
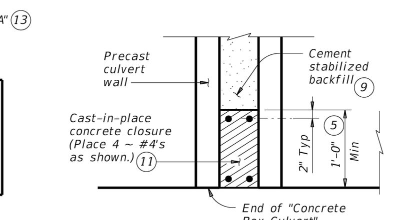
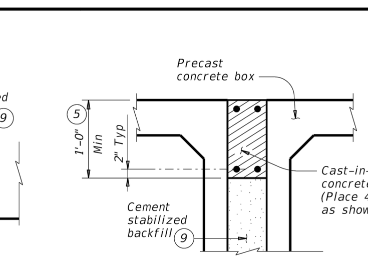


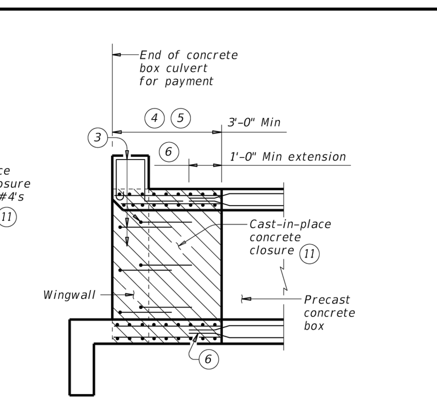
MULTIPLE UNIT PLACEMENT



SECTION B-B

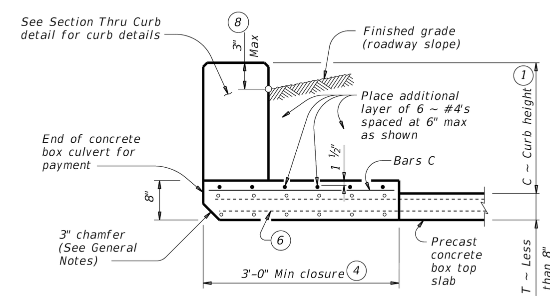


DETAIL "A" ⑬

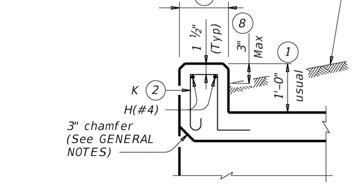


WINGWALL CONNECTION

(Also applies to safety end treatment.)

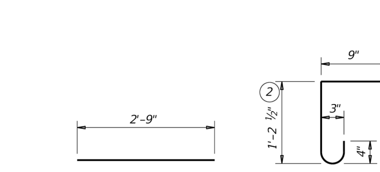


SECTION THRU TOP SLABS LESS THAN 8"



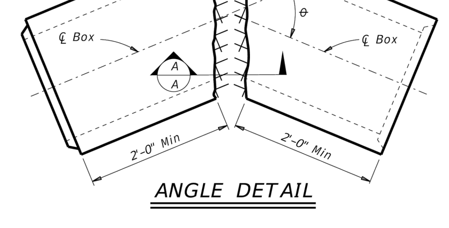
SECTION THRU CURB

QUANTITIES PER FOOT OF CURB ⑩	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY

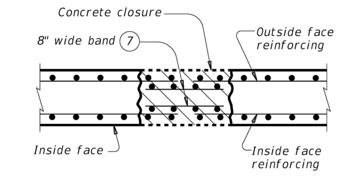


BARS C (#4) (Spa = 1'-0" Max)

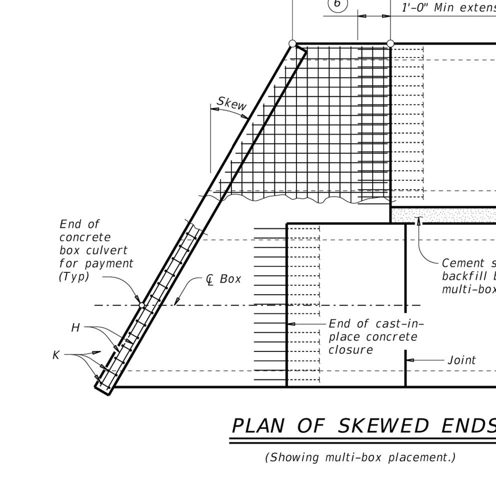
BARS K (#4) (Spa = 1'-0" Max) (Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

② For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

③ Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

④ Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.

⑤ For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.

⑥ Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).

⑦ Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

⑧ For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

⑨ Cement stabilized backfill between boxes is considered part of the box culvert for payment.

⑩ All curb concrete and reinforcing is considered part of the box culvert for payment.

⑪ Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

⑫ 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

⑬ For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

⑭ This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: CD-SCP-MD-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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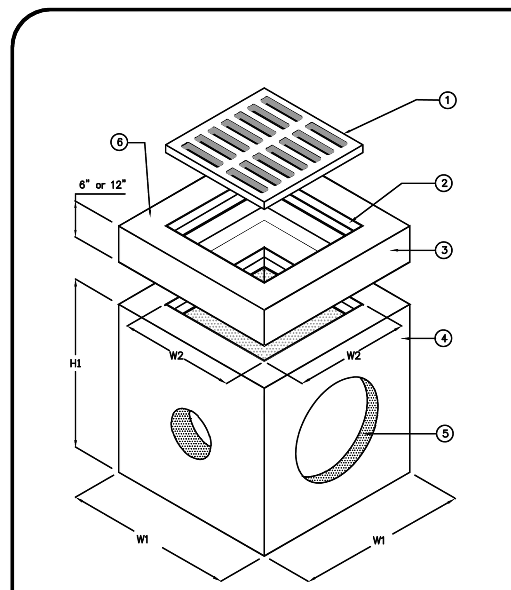
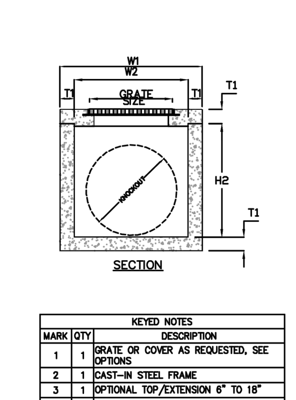


ISOMETRIC

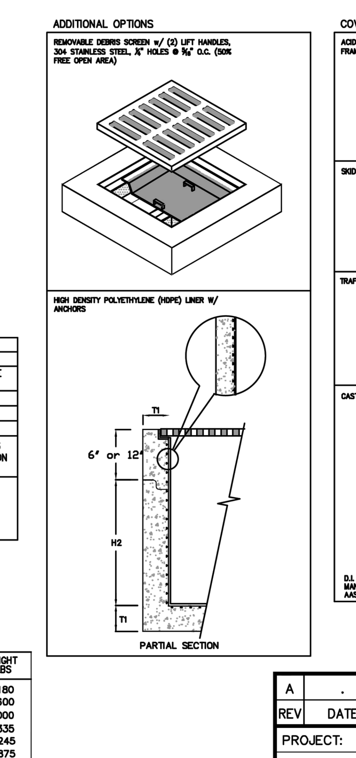
NOTE: KNOCKOUTS-STD, PENETRATIONS-OPTIONAL



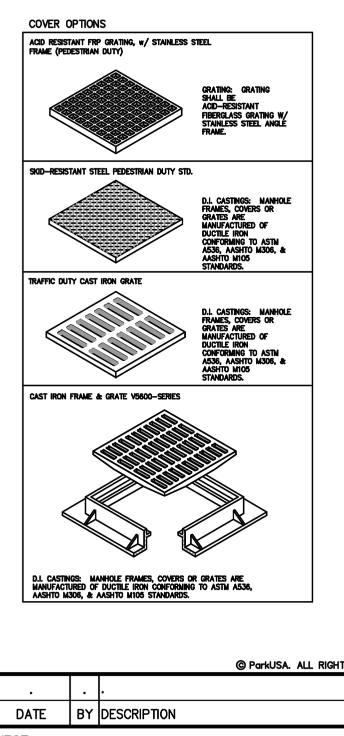
SECTION

KEYED NOTES		
MARK	QTY	DESCRIPTION
1	1	GRATE OR COVER AS REQUESTED, SEE OPTIONS
2	1	CAST-IN STEEL FRAME
3	1	OPTIONAL TOP/EXTENSION 6" TO 18"
4	1	PRECAST CONCRETE BASIN SECTION
5	4	KNOCKOUTS (STD) AND PENETRATIONS (OPT) AS REQUIRED, SEE KO DIMENSION FOR MAXIMUM PIPE O.D.*
6	1	NAMEPLATE INDICATING: MFG: PARKUSA 888-611-PARK WWW.PARKUSA.COM MODEL: CB-01 DATE MANUFACTURED

ADDITIONAL OPTIONS

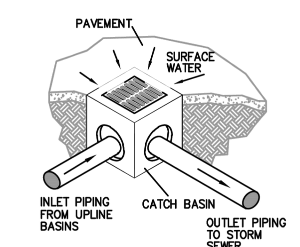


COVER OPTIONS



MODEL	W1	W2	H1	H2	T1	T2	KO	GRATE SIZE	OPEN AREA	WEIGHT LBS
CB-12	15"	10"	21"	18"	3"	2"	10"	12"x12"x1"	90	180
CB-14	20"	12"	28"	24"	4"	4"	12"	14"x14"x1½"	120	600
CB-18	24"	16"	34"	30"	4"	4"	15"	18"x18"x1½"	168	1,000
CB-20	26"	18"	34"	30"	4"	4"	17"	20"x20"x1½"	170	1,335
CB-24	32"	22"	41"	36"	5"	5"	22"	24"x24"x2"	288	2,245
CB-27	37"	25"	42"	36"	6"	6"	24"	27"x27"x2"	350	2,875
CB-30	42"	30"	42"	36"	6"	6"	30"	32"x32"x2"	490	3,675
CB-36	48"	36"	42"	36"	6"	6"	32"	38"x38"x2"	693	4,585
CB-48	60"	48"	54"	48"	6"	6"	48"	38"x38"x2"	693	7,250
*CB-60	72"	60"	66"	60"	6"	6"	60"	38"x38"x2"	693	10,500
*CB-72	84"	72"	78"	72"	6"	6"	72"	38"x38"x2"	693	15,350
*CB-84	96"	84"	78"	72"	6"	6"	72"	38"x38"x2"	693	19,500

*KNOCKOUTS NOT AVAILABLE



SPECIFICATIONS

CONCRETE : CLASS I/II CONCRETE WITH OF DESIGN STRENGTH OF 4500 PSI AT 28 DAYS. UNIT IS OF MONOLITHIC CONSTRUCTION AT FLOOR AND FIRST STAGE OF WALL WITH SECTIONAL RISER TO REQUIRED DEPTH.

REINFORCEMENT: GRADE 60 REINFORCED. STEEL REBAR CONFORMING TO ASTM A615 ON REQUIRED CENTERS OR EQUAL.

C.I. CASTINGS: CAST IRON FRAMES AND GRATES ARE MANUFACTURED OF GREY CAST IRON CONFORMING TO ASTM A48-76 CLASS 30.

CREATED ON 4/19/2024 BY ---- LAST MODIFIED ON 4/19/2024 3:18 PM BY kvu

PLOTTED ON 4/19/2024 3:18 PM BY Vu, Kate, C:\Users\kvu\Desktop\File replacement website\CB-1

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A	.	.	.
REV	DATE	BY	DESCRIPTION

PROJECT: .
CUSTOMER: .
ENGINEER: .
ORDER #: . PROJ #: .
DATE: . LOCATION: .

PARK USA — A Northwest Pipe Company

MARK: –
LINE: –
STA: –
SHEET: –
DATE: –

CATCH BASIN
MODEL CB – 12" THRU 84"

PM	PC	DRN	ENG	DWG. NO.	REV.
.	.	.	.	CB-1	A
DATE .					

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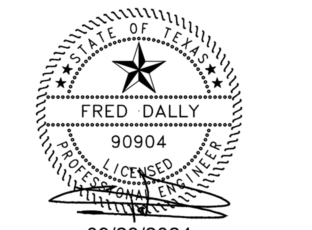


09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	ISSUE FOR BID & PERMIT

SITE DETAILS
SHEET 2 OF 2

Scale: AS NOTED

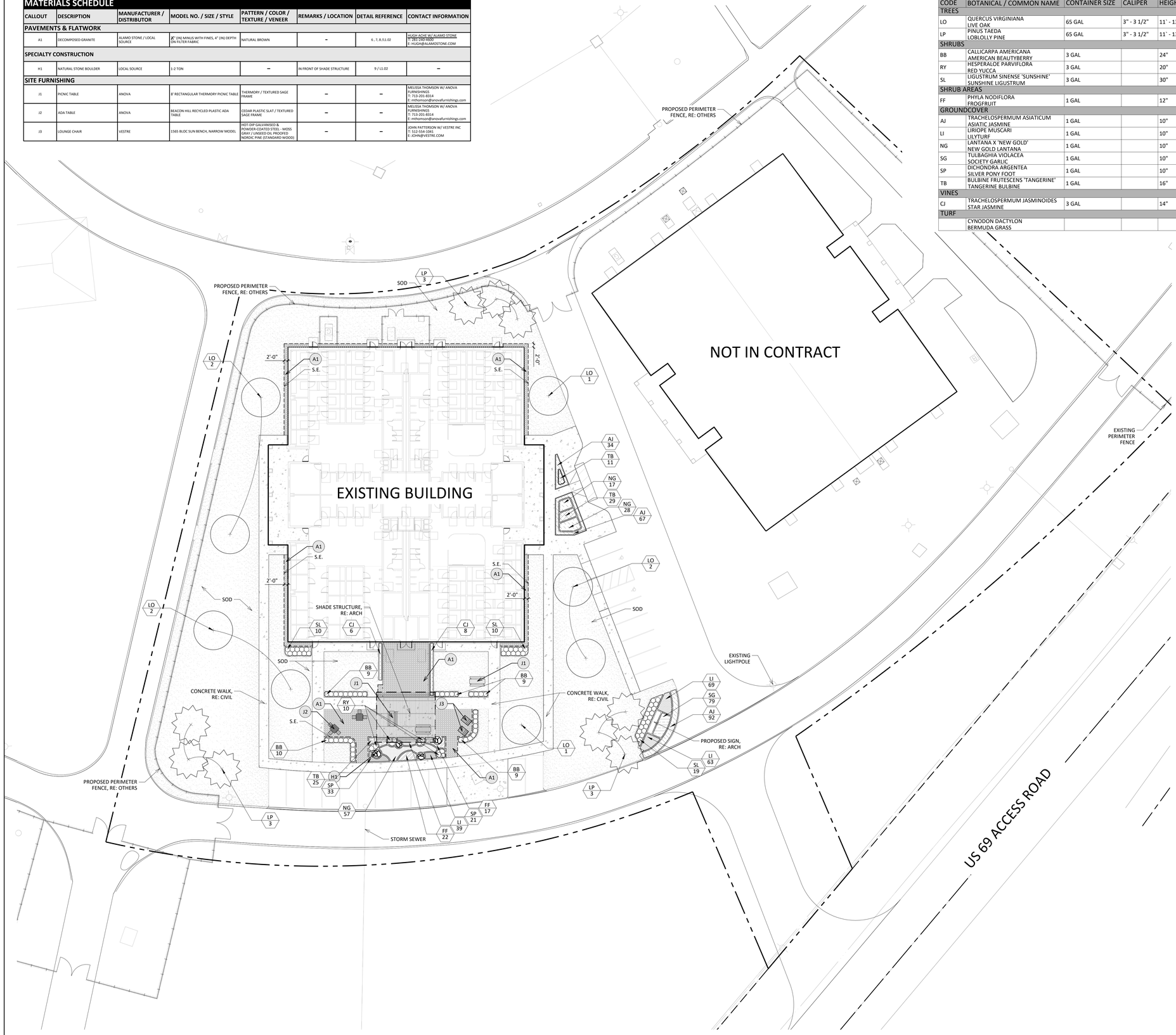
C8.01

MATERIALS SCHEDULE

CALLOUT	DESCRIPTION	MANUFACTURER / DISTRIBUTOR	MODEL NO. / SIZE / STYLE	PATTERN / COLOR / TEXTURE / VENEER	REMARKS / LOCATION	DETAIL REFERENCE	CONTACT INFORMATION
PAVEMENTS & FLATWORK							
A1	DECOMPOSED GRANITE	ALAMO STONE / LOCAL SOURCE	¼" (IN) MINUS WITH FINES, 4" (IN) DEPTH ON FILTER FABRIC	NATURAL BROWN	–	6 , 7, 8 /L1.02	HUGH ACHE W/ ALAMO STONE T: 281-240-4600 E: HUGH@ALAMOSTONE.COM
SPECIALTY CONSTRUCTION							
H1	NATURAL STONE BOULDER	LOCAL SOURCE	1-2 TON	–	IN FRONT OF SHADE STRUCTURE	9 / L1.02	–
SITE FURNISHING							
J1	PICNIC TABLE	ANOVA	8' RECTANGULAR THERMORY PICNIC TABLE	THERMORY / TEXTURED SAGE FRAME	–	–	MELISSA THOMSON W/ ANOVA FURNISHINGS T: 713-201-8314 E: mthomson@anovafurnishings.com
J2	ADA TABLE	ANOVA	BEACON HILL RECYCLED PLASTIC ADA TABLE	CEDAR PLASTIC SLAT / TEXTURED SAGE FRAME	–	–	MELISSA THOMSON W/ ANOVA FURNISHINGS T: 713-201-8314 E: mthomson@anovafurnishings.com
J3	LOUNGE CHAIR	VESTRE	1565 BLOC SUN BENCH, NARROW MODEL	HOT-DIP GALVANISED & POWDER-COATED STEEL - MOSS GRAY / LINSEED OIL PROOFED NORDIC PINE (STANDARD WOOD)	–	–	JOHN PATTERSON W/ VESTRE INC T: 512-554-1041 E: JOHN@VESTRE.COM

PLANT SCHEDULE

CODE	BOTANICAL / COMMON NAME	CONTAINER SIZE	CALIPER	HEIGHT	SPREAD	REMARKS	SPACING	QTY
TREES								
LO	QUERCUS VIRGINIANA LIVE OAK	65 GAL	3" - 3 1/2"	11` - 13`	5` - 6`	FULL, SYMMETRICAL, MATCHED		8
LP	PINUS TAEDA LOBLOLLY PINE	65 GAL	3" - 3 1/2"	11` - 13`	5` - 6`	FULL, SYMMETRICAL, MATCHED, STRONG CENTRAL LEADER		9
SHRUBS								
BB	CALLICARPA AMERICANA AMERICAN BEAUTYBERRY	3 GAL		24"	18"	FULL, WELL ROOTED		37
RY	HESPERALOE PARVIFLORA RED YUCCA	3 GAL		20"	24"	FULL, WELL ROOTED		10
SL	LIGUSTRUM SINENSE 'SUNSHINE' SUNSHINE LIGUSTRUM	3 GAL		30"	12"	FULL, WELL ROOTED	30" O.C.	39
SHRUB AREAS								
FF	PHYLA NODIFLORA FROGFRUIT	1 GAL		12"	12"	FULL WELL ROOTED	16" O.C.	57
GROUNDCOVER								
AJ	TRACHELOSPERMUM ASIATICUM ASIATIC JASMINE	1 GAL		10"	10"	FULL, WELL ROOTED	15" O.C.	193
LI	LIRIOPE MUSCARI LILYTURF	1 GAL		10"	8"	FULL, WELL ROOTED	12" O.C.	171
NG	LANTANA X 'NEW GOLD' NEW GOLD LANTANA	1 GAL		10"	8"	FULL, WELL ROOTED	18" O.C.	102
SG	TULBAGHIA VIOLACEA SOCIETY GARLIC	1 GAL		10"	8"	FULL, WELL ROOTED	12" O.C.	79
SP	DICHONDRA ARGENTEA SILVER PONY FOOT	1 GAL		10"	8"	FULL, WELL ROOTED	12" O.C.	54
TB	BULBINE FRUTESCENS 'TANGERINE' TANGERINE BULBINE	1 GAL		16"	8"	FULL, WELL ROOTED	15" O.C.	40
VINES								
CJ	TRACHELOSPERMUM JASMINOIDES STAR JASMINE	3 GAL		14"	16"	FULL, WELL ROOTED	30" O.C.	14
TURF								
	CYNODON DACTYLON BERMUDA GRASS					SOLID SOD		22,521 SF



PLANT LEGEND

	NURSERY GROWN CONTAINERIZED TREE (CENTER SYMBOL MAY VARY)
	PINE TREE
	ORNAMENTAL TREE
	SHRUB
	SHRUB AREA / GROUND COVER
	SOLID SOD - (BERMUDA)

GENERAL LEGEND

	LIMIT OF WORK (LOW)
	EASEMENT (ESMT)
	IRRIGATION SLEEVE WITH MARKERS
SE	3/16" (IN) STEEL EDGE, COLOR TO BE BLACK (ONLY WHERE INDICATED)
	DECOMPOSED GRANITE
	NATURAL STONE BOULDER

SCALE 1" = 20' - 0"
10 0 20 40

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE/ architecture

4200 Montrose Blvd., Suite 400
Houston, Texas 77006
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CIVIL
DALLY + ASSOCIATES
9800 RICHMOND AVE SUITE 460
HOUSTON, TEXAS 77042
Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
Landscape Contact

STRUCTURAL
DALLY + ASSOCIATES
9800 RICHMOND AVE, SUITE 460
HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

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SEAL:

REGISTERED LANDSCAPE ARCHITECT
DARWIN L. WEINHEIMER
STATE OF TEXAS
1645

09-23-2024

FILE:
DRAWN BY: RJ
CHECKED BY: SH

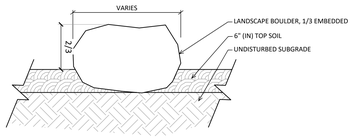
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	ISSUE FOR BID & PERMIT

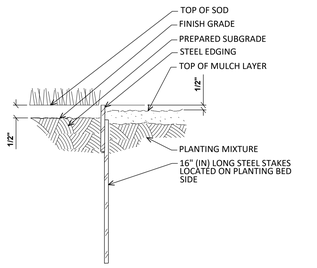
LANDSCAPE PLAN

Scale: AS NOTED

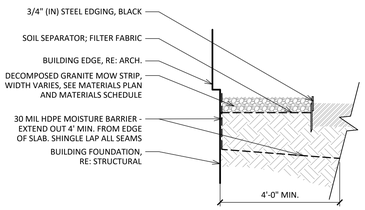
L1.01



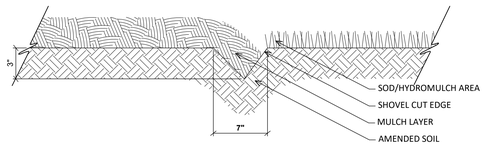
9 LANDCAPE BOULDER
SCALE:NTS SECTION



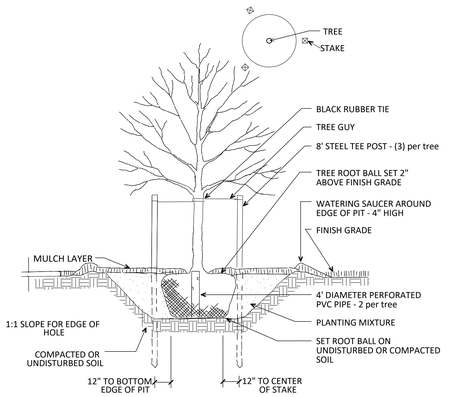
5 STEEL EDGING
N.T.S. S E C T I O N



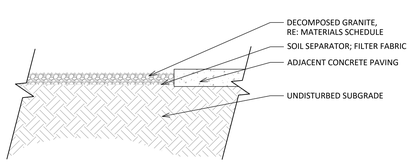
8 DECOMPOSED GRANITE MOWBAND AT BUILDING
SCALE:3/4"=1'-0" SECTION



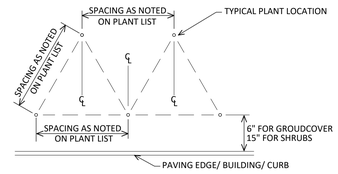
4 PLANTING BED EDGE
N.T.S. S E C T I O N



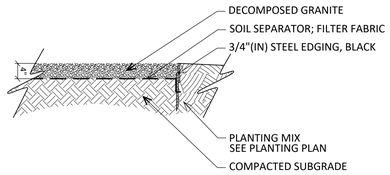
1 STANDARD TREE PLANTING
N.T.S. S E C T I O N



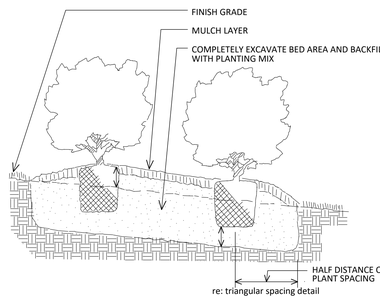
7 DECOMPOSED GRANITE AT CONCRETE
SCALE:3/4"=1'-0" SECTION



3 TRIANGULAR SPACING DIAGRAM
N.T.S. P L A N



6 DECOMPOSED GRANITE W/ STEEL EDGING
SCALE: 3/4" = 1'-0" S E C T I O N



2 SHRUB/GROUNDCOVER PLANTING
N.T.S. S E C T I O N

GENERAL PLANTING NOTES

1) THE GENERAL CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL EXISTING VEGETATION (EXCEPT WHERE NOTED TO REMAIN). BEFORE STARTING WORK, THE LANDSCAPE CONTRACTOR SHALL VERIFY THAT THE GRADE OF ALL LANDSCAPE AREAS ARE WITHIN +/-0.1' OF FINISH GRADE. THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY SHOULD ANY DISCREPANCIES EXIST. SEE SPECIFICATIONS FOR MORE DETAILED INSTRUCTION ON TURF AREA AND PLANTING BED PREPARATION.
2) THE LANDSCAPE CONTRACTOR SHALL CONSTRUCT AND MAINTAIN FINISH GRADES AS SHOWN ON GRADING PLANS, AND CONSTRUCT AND MAINTAIN SLOPES AS RECOMMENDED BY THE GEOTECHNICAL REPORT. ALL LANDSCAPE AREAS SHALL HAVE POSITIVE DRAINAGE AWAY FROM STRUCTURES AT THE MINIMUM SLOPE SPECIFIED IN THE REPORT, AND AREAS OF POTENTIAL PONDING SHALL BE REGRADED TO BLEND IN WITH THE SURROUNDING GRADES AND ELIMINATE POTENTIAL PONDING. SHOULD ANY CONFLICTS AND/OR DISCREPANCIES ARISE BETWEEN THE GRADING PLANS, GEOTECHNICAL REPORT, THESE NOTES, AND ACTUAL CONDITIONS, THE CONTRACTOR SHALL IMMEDIATELY BRING SUCH ITEMS TO THE ATTENTION OF THE LANDSCAPE ARCHITECT AND OWNER.
3) CONTRACTOR SHALL ENSURE THAT THE GRADE IN SOD AREAS SHALL BE 1" BELOW FINISH GRADE AFTER INSTALLING SOIL AMENDMENTS, AND 2" BELOW FINISH GRADE IN SHRUB AREAS AFTER INSTALLING SOIL AMENDMENTS. MULCH COVER WITHIN 6" OF CONCRETE WALKS AND CURBS SHALL NOT PROTRUDE ABOVE THE FINISH SURFACE OF THE WALKS AND CURBS. MULCH COVER WITHIN 12" OF WALLS SHALL BE AT LEAST 3" LOWER THAN THE TOP OF WALL.
4) INSTALL SHREDDED HARDWOOD MULCH TOPDRESSING IN ALL PLANTING BEDS (2" DEPTH) AND ALL TREE RINGS (3" DEPTH). DO NOT INSTALL MULCH WITHIN 6" OF TREE ROOT FLARE.
5) INSTALL 3/16", GREEN STEEL EDGING BETWEEN ALL PLANTING BEDS AND TURF AREAS, AND BETWEEN GROUNDCOVERS AND OTHER PLANTS (WHERE INDICATED ON THE PLAN).
6) HYDROMULCH ALL DISTURBED AREAS OUTSIDE OF PROPERTY LIMITS (UNLESS SHOWN AS SOD)
7) THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR DETERMINING PLANT QUANTITIES; PLANT QUANTITIES SHOWN ON LEGENDS AND CALLOUTS ARE FOR GENERAL INFORMATION ONLY. IN THE EVENT OF A DISCREPANCY BETWEEN THE PLAN AND THE PLANT LEGEND, THE PLANT QUANTITY AS SHOWN ON THE PLAN (FOR INDIVIDUAL SYMBOLS) OR CALLOUT (FOR GROUNDCOVER PATTERNS) SHALL TAKE PRECEDENCE.
8) NO SUBSTITUTIONS OF PLANT MATERIALS SHALL BE ALLOWED. IF SOME OF THE PLANTS ARE NOT AVAILABLE, THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT IN WRITING (VIA PROPER CHANNELS).
9) PLANTS MAY BE INSPECTED AND APPROVED OR REJECTED ON THE JOBSITE BY THE OWNER OR OWNER'S REPRESENTATIVE.
10) THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL WORK SHOWN ON THESE PLANS FOR 90 DAYS BEYOND FINAL ACCEPTANCE OF ALL LANDSCAPE WORK BY THE OWNER. LANDSCAPE MAINTENANCE SHALL INCLUDE WEEKLY SITE VISITS FOR THE FOLLOWING ACTIONS (AS APPROPRIATE): PROPER PRUNING, RESTAKING OF TREES, RESETTING OF PLANTS THAT HAVE SETTLED, MOWING AND AERATION OF LAWNS, WEEDING, RESEEDING AREAS WHICH HAVE NOT GERMINATED WELL, TREATING FOR INSECTS AND DISEASES, REPLACEMENT OF MULCH, REMOVAL OF LITTER, REPAIRS TO THE IRRIGATION SYSTEM DUE TO FAULTY PARTS AND/OR WORKMANSHIP, AND THE APPROPRIATE WATERING OF ALL PLANTINGS. THE LANDSCAPE CONTRACTOR SHALL MAINTAIN THE IRRIGATION SYSTEM IN PROPER WORKING ORDER, WITH SCHEDULING ADJUSTMENTS BY SEASON TO MAXIMIZE WATER CONSERVATION.
11) SHOULD SEEDED AND/OR SODDED AREAS NOT BE COVERED BY AN AUTOMATIC IRRIGATION SYSTEM, THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR WATERING THESE AREAS AND OBTAINING A FULL STAND OF GRASS AT NO ADDITIONAL COST TO THE OWNER.
12) TO ACHIEVE FINAL ACCEPTANCE AT THE END OF THE MAINTENANCE PERIOD, ALL OF THE FOLLOWING CONDITIONS MUST OCCUR:
A. THE LANDSCAPE SHALL SHOW ACTIVE, HEALTHY GROWTH (WITH EXCEPTIONS MADE FOR SEASONAL DORMANCY). ALL PLANTS NOT MEETING THIS CONDICTION SHALL BE REJECTED AND REPLACED BY HEALTHY PLANT MATERIAL PRIOR TO FINAL ACCEPTANCE.
B. ALL HARDSCAPE SHALL BE CLEANED PRIOR TO FINAL ACCEPTANCE.
C. SODDED AREAS MUST BE ACTIVELY GROWING AND MUST REACH A MINIMUM HEIGHT OF 1 1/2 INCHES BEFORE FIRST MOWING. HYDROMULCHED AREAS SHALL SHOW ACTIVE, HEALTHY GROWTH. BARE AREAS LARGER THAN TWELVE SQUARE INCHES MUST BE RESODDED OR RESEEDED (AS APPROPRIATE) PRIOR TO FINAL ACCEPTANCE. ALL SODDED TURF SHALL BE NEATLY MOWED.
13) SEE SPECIFICATIONS AND DETAILS FOR FURTHUR REQUIREMENTS.

GENERAL LANDSCAPE NOTES

1) PLANTING SOIL MIXTURE SHALL BE ONE OF THE FOLLOWING:

LANDSCAPE MIX		
"PREMIUM BED MIX" BY THE GROUND UP CONTACT AT (832) 247-2574	OR	"ULTRA SOIL" BY LIVING EARTH TECHNOLOGY GROUP CONTACT AT (713) 466-7360 OR CONTACT AT (281) 342-6113

2) BIDDING CONTRACTORS BE ADVISED THAT ALL NEW TREE MATERIAL IS TO BE CONTAINER GROWN, CORRESPONDING TO STATED ROOT BALL SIZES AS RECOGNIZED BY INDUSTRY STANDARDS. THIS SHALL EXCLUDE ALL B&B, MACHINE MOVED, OR TRANSPLANTED TREES FROM THE BIDDING PROCESS UNLESS OTHERWISE INDICATED ON THE PLAN. THE INSTALLATION CONTRACTOR SHALL BE PREPARED TO PROVIDE PHOTOGRAPHS OF INTENDED PLANT MATERIAL ALONG WITH SIGNED CLARIFICATION THAT PLANT MATERIAL MEETS THESE REQUIREMENTS AND THAT NO VARIATIONS OR SUBSTITUTIONS HAVE BEEN MADE.
3) THE LANDSCAPE CONTRACTOR DOING THE INSTALLATION OF THIS WORK SHALL SUBMIT TO KUDELA & WEINHEIMER INFORMATION REGARDING SOURCING OF PLANT MATERIAL. ALL PLANT MATERIAL MUST BE CONTAINER GROWN AND APPROVED AT THE SOURCE OF GROWTH BY KUDELA & WEINHEIMER. TREE MATERIAL MEETING THE SPECIFICATIONS WILL BE TAGGED WITH A SERIALIZED LOCKING TAG AT THE NURSERY BY KUDELA & WEINHEIMER. PLANTS ARRIVING AT THE JOB SITE WITHOUT THESE TAGS WILL BE CATEGORICALLY REJECTED AT THE CONTRACTOR'S EXPENSE.
4) IF THE PLANTING PLAN DOES NOT AGREE WITH THE PLANT LIST, THE QUANTITIES INDICATED GRAPHICALLY ON THE PLANTING PLAN SHALL GOVERN.
5) CONTRACTOR IS RESPONSIBLE FOR THE GRADING OF PARKING LOT ISLANDS AND SETBACKS. GRADE CHANGES SHALL RANGE FROM 8" (INCH) TO 15" (INCH) ABOVE THE CURB, DEPENDING ON THE SIZE OF THE ISLAND. SELECT TOPSOIL SHALL BE USED FOR THESE BERMS. SEE PARKING ISLAND TREE DETAIL.
6) ALL DISTURBED AREAS ARE TO RECEIVE 6" (INCHES) OF TOPSOIL, TOPPED WITH MULCH, SOD, OR HYDROMULCH (DEPENDING ON THE AREA), AND IS TO BE WATERED UNTIL A HEALTHY STAND OF GRASS IS ESTABLISHED.
7) ALL TREES PLANTED ADJACENT TO ACCESSIBLE ROUTES AND ACCESSIBLE AREAS SHALL NOT HAVE LIMBS BELOW 80" (IN) ABOVE FINISH GRADE.

GENERAL NOTES

1) LOCATE AND VERIFY THE CONDITION OF EXISTING UTILITIES PRIOR TO BEGINNING SITE WORK. CONTRACTOR IS RESPONSIBLE FOR CONTACTING UTILITY LOCATION SERVICES AND ANY COST INCURRED FOR BODILY INJURY AND/OR DAMAGE OF SAID UTILITIES OR OWNER'S PROPERTY.
2) CONTRACTOR TO NOTIFY LANDSCAPE ARCHITECT OF ANY DISCREPENCIES IDENTIFIED BETWEEN PLANS AND SITE CONDITIONS PRIOR TO STARTING WORK. CONTRACTOR SHALL BE LIABLE FOR ALL MODIFICATIONS AND DAMAGES IF WORK PROCEEDS WITHOUT SAID NOTIFICATION.
3) CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A SAFE WORK SITE, INCLUDING BUT NOT LIMITED TO PROVIDING FOR TRAFFIC CONTROL, INSTALLATION AND PLACEMENT OF FENCING AND BARRICADES, EXCAVATION AND TRENCH PROTECTION, AND COMPLIANCE WITH ALL FEDERAL AND LOCAL REGULATIONS AND CODES. ALL SAFETY EXPOSURES OR VIOLATIONS SHALL BE RECTIFIED IMMEDIATELY.
4) CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF ALL EXISTING IMPROVEMENTS BOTH ON SITE AND ADJACENT TO THE WORK SITE AND SHALL REPAIR ANY DAMAGE CAUSED BY SAID CONTRACTOR TO THESE IMPROVEMENTS TO THE SATISFACTION OF THE OWNER.
5) CONTRACTOR SHALL NOTIFY OWNER AND LANDSCAPE ARCHITECT FORTY-EIGHT (48) HOURS PRIOR TO START OF WORK.
6) ANY ALTERNATES OR SUBSTITUTIONS PROPOSED BY THE CONTRACTOR SHALL BE SUBMITTED TO THE LANDSCAPE ARCHITECT FOR APPROVAL CHANGES TO THE SCOPE OF WORK AND/OR CONTRACT DOCUMENTS RESULTING FROM THE ACCEPTANCE OF THE CONTRACTOR'S ALTERNATES AND/OR SUBSTITUTIONS SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
7) THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A CLEAN SITE TO THE SATISFACTION OF THE OWNER. CONTRACTOR SHALL REMOVE TRASH ON A DAILY BASIS. THIS INCLUDES CONSTRUCTION RELATED DEBRIS LEFT ON ADJACENT PROPERTY, ROADS, DRIVEWAYS AND WITHIN THE CITY RIGHT OF WAY.
8) CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. ALL PERMITS AND APPROVALS REQUIRED FOR CONSTRUCTION SHALL BE PAID FOR AND OBTAINED BY THE CONTRACTOR PRIOR TO STARTING THE WORK.
9) CONTRACTOR SHALL COORDINATE WORK WITH SUBCONTRACTORS TO ACCOMPLISH THE SCOPE OF WORK AS SHOWN AND NOTED IN THE CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE WITH OTHER CONTRACTORS WORKING ON SITE.
10) CONTRACTOR SHALL COORDINATE STORING OF MATERIALS, PARKING OF VEHICLES, AND RESTRICTIONS OF WORK AND ACCESS WITH THE OWNER. UNDER NO CIRCUMSTANCE SHALL CONTRACTOR STORE MATERIALS OR PARK VEHICLES OR EQUIPMENT UNDER THE CANOPY OF EXISTING TREES.
11) CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND SERVICING TEMPORARY TOILET FACILITIES.
12) CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND PAYING ALL TEMPORARY UTILITIES AND SERVICES NECESSARY TO COMPLETELY INSTALL ALL WORK AS SHOWN AND NOTED IN THE CONTRACT DOCUMENTS.
13) CONTRACTOR SHALL BE RESPONSIBLE FOR THE LEGAL OFF-SITE DISPOSAL OF SURPLUS MATERIAL AND DEBRIS.
14) CONTRACTOR SHALL THOROUGHLY CLEAN THE PROJECT SITE OF ALL TRASH, REPAIR ALL DAMAGE TO FINISH GRADE, INCLUDING TAILINGS FROM EXCAVATIONS, WHEEL RUTS AND ANY SETTLING OR EROSION THAT HAS OCCURRED PRIOR TO COMPLETION UPON COMPLETION OF CONSTRUCTION AND PRIOR TO FINAL APPROVAL. ALL AREAS OF THE PROJECT SITE SHALL BE LEFT IN A NEAT AND PRESENTABLE CONDITION SATISFACTORY TO THE OWNER PRIOR TO SUBMITTAL OF FINAL PAYMENT.

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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Ownership of Instruments of Service:
All reports, plans, specifications, computer files, field data, notes & other documents and instruments prepared by BRAVE / ARCHITECTURE in connection with this project shall remain the property of BRAVE / ARCHITECTURE. BRAVE / ARCHITECTURE shall retain all common law, statutory and other reserved rights, including the copyright thereto.

SEAL:

REGISTERED LANDSCAPE ARCHITECT DARRYL L. WEINHEIMER 1645 STATE OF TEXAS

09-23-2024

FILE:
DRAWN BY: RJ
CHECKED BY: SH

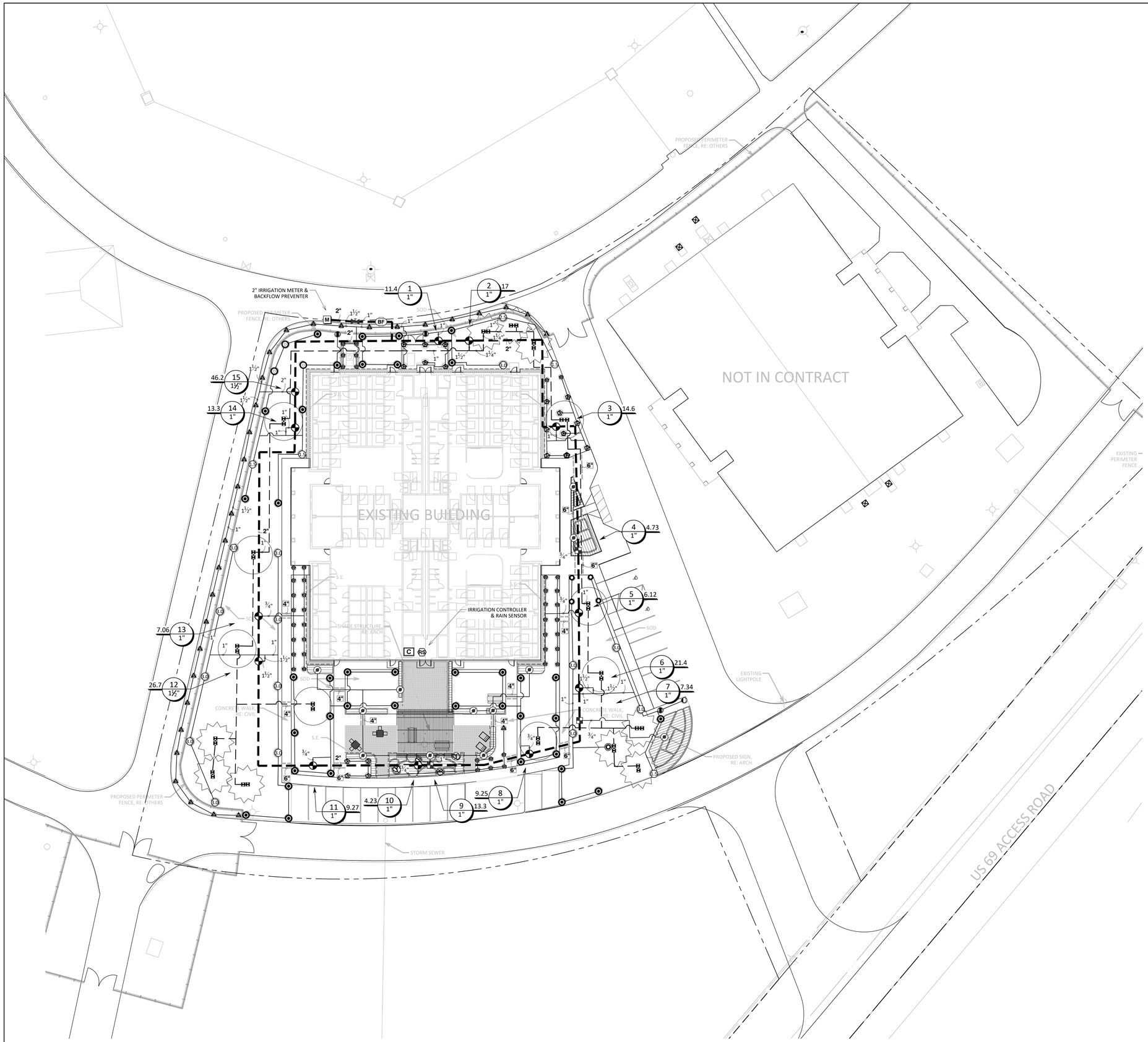
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	ISSUE FOR BID & PERMIT

LANDSCAPE NOTES AND DETAILS

Scale: AS NOTED

L1.02



CRITICAL ANALYSIS

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P.O.C. NUMBER: 01	
Water Source Information:	
FLOW AVAILABLE	
Water Meter Size:	2"
Flow Available	120 GPM
PRESSURE AVAILABLE	
Static Pressure at POC:	60 PSI
Elevation Change:	5.00 ft
Service Line Size:	3"
Length of Service Line:	20 ft
Pressure Available:	57 PSI
DESIGN ANALYSIS	
Maximum Station Flow:	46.18 GPM
Flow Available at POC:	120 GPM
Residual Flow Available:	73.82 GPM
Critical Station:	6
Design Pressure:	40 PSI
Friction Loss:	0.92 PSI
Fittings Loss:	0.1 PSI
Elevation Loss:	0 PSI
Loss through Valve:	3.28 PSI
Pressure Req. at Critical Station:	44.3 PSI
Loss for Fittings:	0.06 PSI
Loss for Main Line:	0.61 PSI
Loss for POC to Valve Elevation:	0 PSI
Loss for Backflow:	11.6 PSI
Loss for Water Meter:	0.46 PSI
Critical Station Pressure at POC:	57.0 PSI
Pressure Available:	57 PSI
Residual Pressure Available:	0.01 PSI

SCALE 1" = 20' - 0"
10 0 20 40

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REGISTERED LANDSCAPE ARCHITECT
KYLE HERRMANN
STATE OF TEXAS

09-23-2024

FILE:
DRAWN BY: RJ
CHECKED BY: SH

ISSUE:

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06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	ISSUE FOR BID & PERMIT

IRRIGATION PLAN

Scale: AS NOTED

L2.01

IRRIGATION SCHEDULE

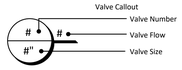
SYMBOL	MANUFACTURER/MODEL/DESCRIPTION	PSI		DETAIL
ES LCS RCS CS SS	HUNTER PROS-04-PRS30 STRIP SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
Q T H F	HUNTER PROS-04-PRS30 8 SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
Q T H F	HUNTER PROS-04-PRS30 10 SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
Q T H F	HUNTER PROS-04-PRS30 12 SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
Q T H F	HUNTER PROS-04-PRS30 15 SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
	HUNTER PROS-04-PRS30 ADJ SERIES TURF SPRAY, 30 PSI REGULATED 4IN. POP-UP. CO-MOLDED WIPER SEAL WITH UV RESISTANT MATERIAL.	30		
LST SST RST	RAIN BIRD R-VAN-STRIP 1804-SAM-P45 SHRUB ROTARY, 5FT.X15FT. (LCS AND RCS), 5FT.X30FT. (SST) HAND ADJUSTABLE MULTI-STREAM ROTARY W/ 1800 TURF SPRAY BODY ON 4IN. POP-UP, WITH CHECK VALVE AND 45 PSI IN-STEM PRESSURE REGULATOR. 1/2IN. NPT FEMALE THREADED INLET.	40		
14 ADJ 14 F	RAIN BIRD R-VAN14 1804-SAM-P45 TURF ROTARY, 8FT.-14FT. 45-270 DEGREES AND 360 DEGREES. HAND ADJUSTABLE MULTI-STREAM ROTARY W/1800 TURF SPRAY BODY ON 4IN. POP-UP, WITH CHECK VALVE AND 45 PSI IN-STEM PRESSURE REGULATOR. 1/2IN. NPT FEMALE THREADED INLET.	40		
18 ADJ 18 F	RAIN BIRD R-VAN18 1804-SAM-P45 TURF ROTARY, 13FT.-18FT. 45-270 DEGREES AND 360 DEGREES. HAND ADJUSTABLE MULTI-STREAM ROTARY W/1800 TURF SPRAY BODY ON 4IN. POP-UP, WITH CHECK VALVE AND 45 PSI IN-STEM PRESSURE REGULATOR. 1/2IN. NPT FEMALE THREADED INLET.	40		
24 ADJ 24 F	RAIN BIRD R-VAN24 1804-SAM-P45 TURF ROTARY, 17FT.-24FT. 45-270 DEGREES AND 360 DEGREES. HAND ADJUSTABLE MULTI-STREAM ROTARY W/1800 TURF SPRAY BODY ON 4IN. POP-UP, WITH CHECK VALVE AND 45 PSI IN-STEM PRESSURE REGULATOR. 1/2IN. NPT FEMALE THREADED INLET.	40		
25 50 10 20	HUNTER AFB ADJUSTABLE FLOW BUBBLER, 1/2IN. FIPT, STAINLESS STEEL SCREW ADJUSTMENT.	20		

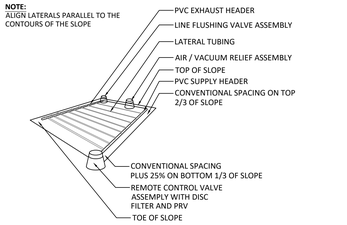
SYMBOL	MANUFACTURER/MODEL/DESCRIPTION	PSI	GPM	DETAIL
1.5	HUNTER PGP-04 1.5 TURF ROTOR, 4IN. POP-UP. ADJUSTABLE TO FULL CIRCLE.	35	1.4	
2.5	HUNTER PGP-04 2.5 TURF ROTOR, 4IN. POP-UP. ADJUSTABLE TO FULL CIRCLE.	35	2.1	
3.0	HUNTER PGP-04 3.0 TURF ROTOR, 4IN. POP-UP. ADJUSTABLE TO FULL CIRCLE.	35	2.7	

SYMBOL	MANUFACTURER/MODEL/DESCRIPTION			DETAIL
	RAIN BIRD XCZ-100-LC WIDE FLOW DRIP CONTROL KIT, FOR LIGHT COMMERCIAL USES. 1IN. PEB VALVE, WITH 1IN. PRESSURE REGULATING 40PSI BASKET FILTER. 0.3-20 GPM.			
	PIPE TRANSITION POINT IN DRIP BOX PIPE TRANSITION POINT FROM PVC LATERAL TO DRIP TUBING WITH RISER IN 6IN. DRIP BOX.			
	AREA TO RECEIVE DRIPLINE RAIN BIRD XFCV-09-12 XFCV ON-SURFACE LANDSCAPE DRIPLINE WITH A HEAVY-DUTY 3.5 PSI CHECK VALVE. 0.9 GPH EMITTERS AT 12" O.C. DRIPLINE LATERALS SPACED AT 12" APART, WITH EMITTERS OFFSET FOR TRIANGULAR PATTERN. GREAT FOR ELEVATION CHANGE. SPECIFY XF INSERT FITTINGS.			

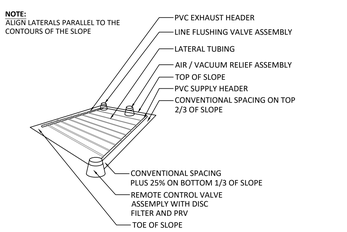
SYMBOL	MANUFACTURER/MODEL/DESCRIPTION			DETAIL
	RAIN BIRD PEB 1IN., 1-1/2IN., 2IN., 3IN. PLASTIC INDUSTRIAL REMOTE CONTROL VALVE. LOW FLOW OPERATING CAPABILITY, GLOBE CONFIGURATION.			
	SHUT OFF VALVE			
BF	FEBCO 860 2" REDUCED PRESSURE BACKFLOW PREVENTER			
C	RAIN BIRD ESPLXME2 W/ (1) ESPLXMSM12 24 STATION, TRADITIONALLY-WIRED, COMMERCIAL CONTROLLER. (1) ESPLXME2 12-STATION, INDOOR/OUTDOOR, PLASTIC WALL-MOUNT ENCLOSURE W/ (1) ESPLXMSM12 - 12-STATION EXPANSION MODULES.			
RS	RAIN BIRD RSD-BEX RAIN SENSOR, WITH METAL LATCHING BRACKET, EXTENSION WIRE.			
M	WATER METER 2"			
	IRRIGATION LATERAL LINE: PVC CLASS 200 SDR 21			
	IRRIGATION LATERAL LINE: PVC CLASS 200 SDR 21			
	IRRIGATION MAINLINE: PVC SCHEDULE 40			
	PIPE SLEEVE: PVC SCHEDULE 40			

Valve Callout





13 SLOPE FEED LAYOUT
SCALE: NOT TO SCALE



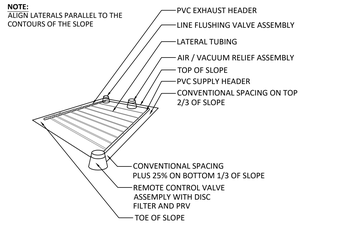
13 SLOPE FEED LAYOUT
SCALE: NOT TO SCALE

GENERAL IRRIGATION NOTES

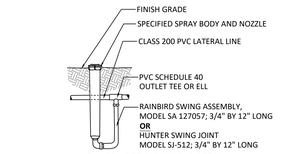
1) An automatic irrigation system shall be installed and operational by the time of final inspection. The entire irrigation system shall be installed by a licensed and qualified irrigation contractor.
2) Install all irrigation components as per manufacturer's requirements and specifications.
3) Install valve boxes parallel to curbs, buildings, and to each other. Install 6" of Pea Gravel under all control valves. Contractor to install four bricks under corners of valve boxes. Install valve boxes perpendicular to finished grade.
4) All control wires should be located underneath mainline piping inside trenches. Provide 3' loop of wire at all 90 degree turns. For conventional wired systems, provide 2 additional wires, colored different from other wires used, with 3' looped in all valve boxes. For 2-Wire systems, provide 3' loop of wire at all wire splices. All wire connections, including decoder to solenoid connections, are to be made with 3M DBR/Y direct burial splice kits.
5) Contractor to field verify best possible location for rain/freeze sensor within wireless range of sensor receiver. Locate on top of fence or on the roof of the building if possible to allow for accurate monitoring of rainfall.
6) All trenching within the dripline of existing trees is to be done by hand or air spade. No mechanical trenching under canopy of existing trees. No roots larger than 1-1/2" in diameter shall be cut. Clean cut any roots smaller than 1-1/2" with proper pruning equipment.
7) Irrigation heads and components shall be located a MINIMUM of 24 inches from all buildings to avoid adverse performance of foundations and slabs due to shrinking and swelling of clay subsoils. Installation and Maintenance contractor to closely monitor system to ensure that excessive irrigation moisture does not cause swelling of clay subsoil thereby causing harm to foundations and slabs.
8) Contractor to install all required ground rods/plates to ground controller and 2-Wire path per manufacturer's guidelines. Grounding location are not shown on plan due to diagrammatic nature of plans. Contractor to record grounding locations on as-built drawings and provide to owner.
9) All trenches and holes must be backfilled to finished grade with suitable soil free of any objects that could damage the plumbing of the irrigation system. The backfill must be compacted such that a depression does not develop.
10) Areas to receive sod shall have components installed 1" above finished grade to allow for soil depth of sod so that heads and valve boxes are flush with finished soil level. Areas to receive hydromulch shall have components installed at finished grade so that heads and valve boxes are flush with finished soil level. Heads in planting areas shall be installed so that they are flush with finished grade.
11) System to be installed by licensed irrigation contractor. Contractor to install system according to all TCEQ and local regulations.
12) Irrigation in Texas is regulated by the Texas Commission On Environmental Quality (TCEQ) (MC-178), P. O. Box 13087, Austin, Texas78711-3087. TCEQ's web site is: www.tceq.state.tx.us

VALVE SCHEDULE

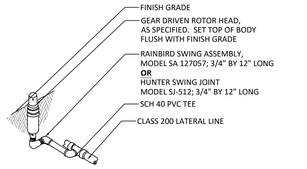
NUMBER	MODEL	SIZE	TYPE	GPM	PSI	PSI @ POC	PRECIP
1	RAIN BIRD PEB	1"	TURF ROTARY	11.42	42.5	54.0	0.78 in/h
2	RAIN BIRD PEB	1"	BUBBLER	17	25.5	37.3	2.21 in/h
3	RAIN BIRD PEB	1"	TURF SPRAY	14.6	33.5	45.1	1.62 in/h
4	RAIN BIRD XCZ-100-LC	1"	AREA FOR DRIPLINE	4.73	27.1	38.6	1.44 in/h
5	RAIN BIRD PEB	1"	TURF SPRAY	6.12	32.0	43.5	1.25 in/h
6	RAIN BIRD PEB	1"	TURF ROTOR	21.42	44.3	57.0	0.54 in/h
7	RAIN BIRD XCZ-100-LC	1"	AREA FOR DRIPLINE	7.34	30.9	42.4	1.44 in/h
8	RAIN BIRD PEB	1"	TURF ROTARY	9.25	42.6	54.1	0.54 in/h
9	RAIN BIRD XCZ-100-LC	1"	AREA FOR DRIPLINE	13.31	37.1	48.8	1.44 in/h
10	RAIN BIRD PEB	1"	TURF SPRAY	4.23	31.8	43.3	1.2 in/h
11	RAIN BIRD PEB	1"	TURF ROTARY	9.27	42.9	54.5	0.49 in/h
12	RAIN BIRD PEB	1-1/2"	TURF ROTOR	26.66	40.8	54.5	0.5 in/h
13	RAIN BIRD PEB	1"	TURF SPRAY	7.06	32.3	43.8	1.36 in/h
14	RAIN BIRD PEB	1"	TURF ROTARY	13.32	43.1	54.7	0.78 in/h
15	RAIN BIRD PEB	1-1/2"	TURF SPRAY	46.18	38.8	54.7	1.48 in/h



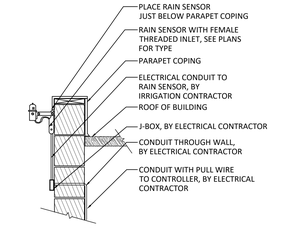
13 SLOPE FEED LAYOUT
SCALE: NOT TO SCALE



12 HIGH-POP SPRAY HEAD DETAIL
SCALE: NOT TO SCALE



11 GEAR DRIVEN ROTOR HEAD
SCALE: NOT TO SCALE



10 RAIN SENSOR
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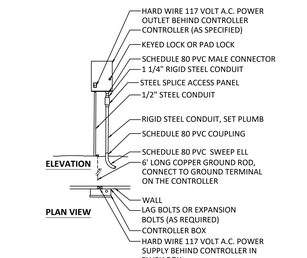

9 WALL MOUNTED CONTROLLER
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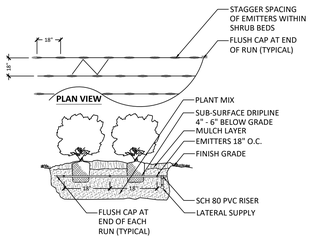
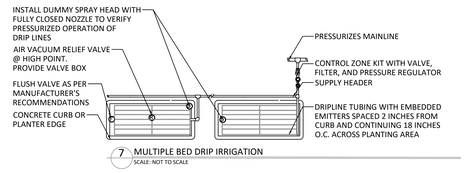
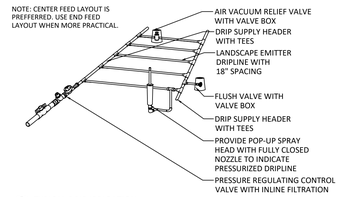


8 18X18 SUB-SURFACE DRIP IRRIGATION DETAIL
SCALE: NOT TO SCALE

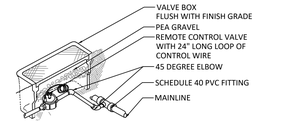
NOTES:
CENTER FEED LAYOUT IS PREFERRED. USE END FEED LAYOUT WHEN MORE PRACTICAL.
TO CALCULATE WATER USAGE IN GALLON PER MINUTE (GPM) DETERMINE TOTAL SQUARE FEET OF PLANTING BED, DIVIDE BY 100, AND MULTIPLY BY 0.4
INSTALL ALL DRIP IRRIGATION COMPONENTS, AS PER MANUFACTURER'S INSTRUCTIONS



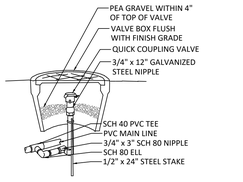
7 MULTIPLE BED DRIP IRRIGATION
SCALE: NOT TO SCALE



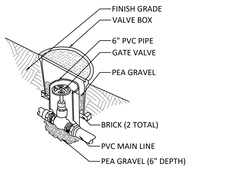
6 TYPICAL DRIP IRRIGATION
SCALE: NOT TO SCALE



5 REMOTE CONTROL VALVE DETAIL
SCALE: NOT TO SCALE



4 QUICK COUPLING VALVE DETAIL
SCALE: NOT TO SCALE



3 GATE VALVE DETAIL
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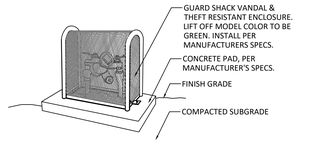
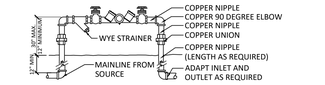


2 BACKFLOW VALVE COVER
SCALE: NOT TO SCALE

NOTE:
WRAP ALL ABOVE GROUND COMPONENTS WITH INSULATION FOR FREEZE PROTECTION OR INSTALL INSULATED FIBERGLASS ENCLOSURE.



1 REDUCED PRESSURE BACKFLOW PREVENTOR
SCALE: NOT TO SCALE

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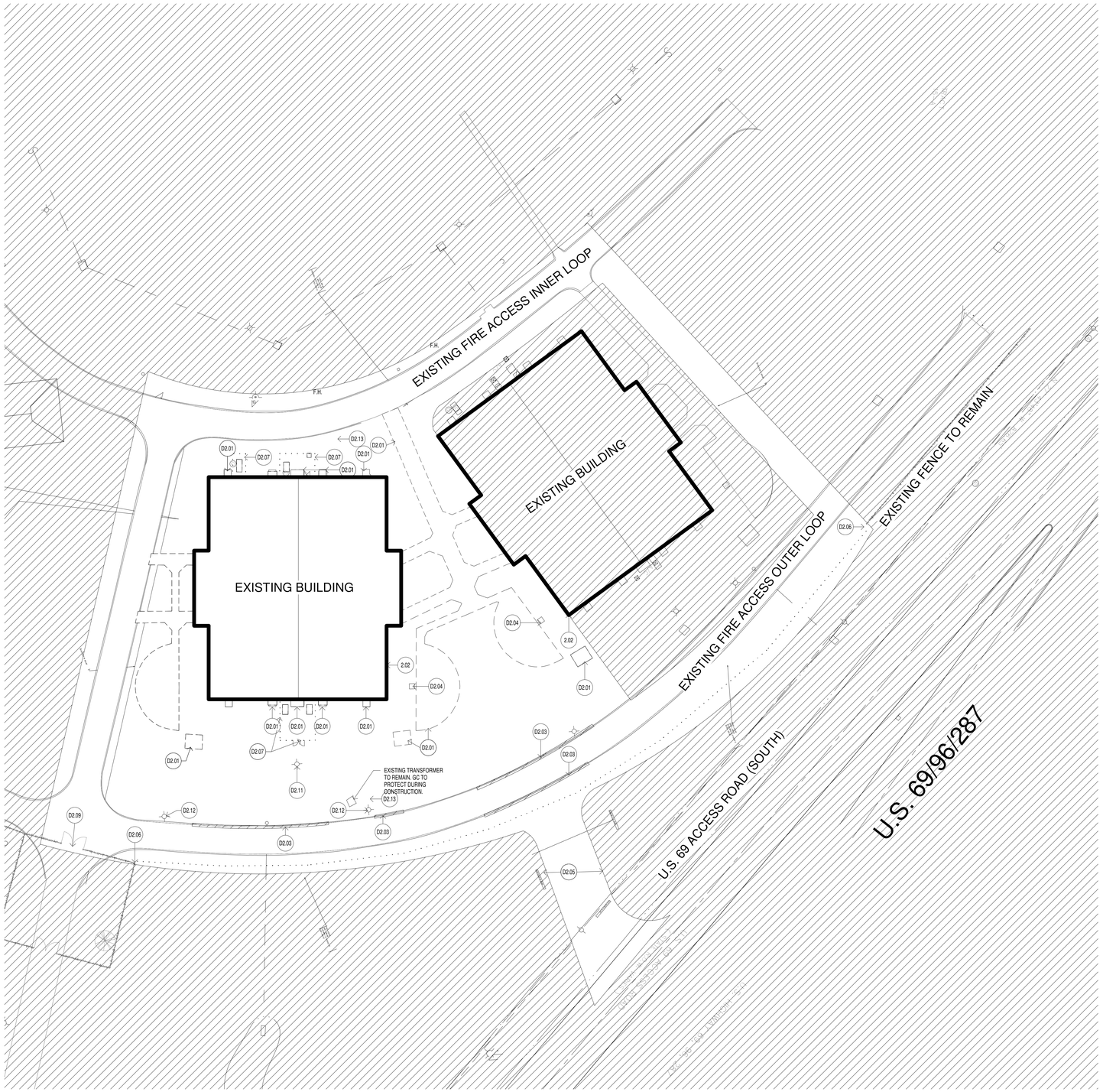
IRRIGATION NOTES AND DETAILS

Scale: AS NOTED

L2.02



NORTH

DEMOLITION - SITE PLAN — 1/32" = 1'-0" | 1

2.02 Existing building
D2.01 Remove concrete paving as indicated; re: Civil
D2.03 Remove concrete curb as required for new construction; re: Civil
D2.04 Remove Basket Ball Hoop, concrete and prepare to receive new Landscape
D2.05 Clear out this area to prepare for new access street.
D2.06 Remove site fencing and curb to this line as necessary for New Construction. Salvage Fence as directed by Owners. Prepare to receive new landscape.
D2.07 Remove Chain-link Fence and Gate; patch and prepare surface to receive new Fence and Gate
D2.09 Existing Site Fence and Gate to Remain
D2.11 Existing light pole to be removed; re: Electrical and Civil
D2.12 Existing light pole to remain; re: Electrical and Civil
D2.13 Remove and Clean up this area to receive new landscape; Re Landscape

KEYNOTES | 2

NOT IN SCOPE

EXISTING SIDEWALK TO BE DEMOLISHED

EXISTING FENCE TO REMAIN

EXISTING FENCE TO BE DEMOLISHED

F.H. EXISTING FIRE HYDRANT

NOTES:
1.

GENERAL NOTES | 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

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14292
STATE OF TEXAS

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DEMOLITION - SITE PLAN

Scale: AS NOTED

D.010

DEMO IMAGES - EXISTING GATE | 20

DEMO IMAGES - SITE SOUTH | 16

DEMO IMAGES - MECHANICAL YARD FENCE | 12

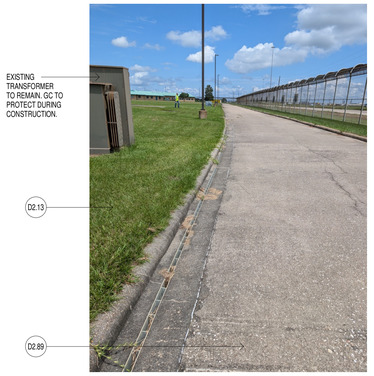
DEMO IMAGES - ENTRY CANOPY AND SOFFIT | 19

DEMO IMAGES - SOUTH FACE | 15

DEMO IMAGES - SITE FENCE | 11

DEMO IMAGES - NOT USED | 18

DEMO IMAGES - LIGHT POLE AND TRANSFORMER | 14



DEMO IMAGES - SITE FENCE | 10

DEMO IMAGES - NOT USED | 17

DEMO IMAGES - NOT USED | 13

DEMO IMAGES - NOT USED | 9

JEFFERSON COUNTY DIVERSION CENTER
BRAVE ARCHITECTURE

13. OVERALL VIEW OF STANDING SEAM METAL TRAPEZOIDAL PANEL ROOF SYSTEM

14. REPAIRS TO ROOF RIDGE, RAKE EDGE, AND METAL ROOF PANELS ALONG NORTH ELEVATION

15. REPAIRS TO ROOF PANELS ALONG NORTH ELEVATION RAKE EDGE

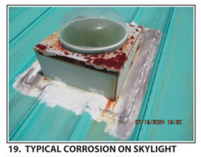
16. ROOF PENETRATION REMOVED WITHOUT SEALING OR COVERING RUBBER BOOT

17. CAP MISSING ON VENT PENETRATION

18. TYPICAL REPAIRS TO SKYLIGHT TUBE CURB FLASHING

EXISTING ROOF CONDITION | 7

JEFFERSON COUNTY DIVERSION CENTER
BRAVE ARCHITECTURE



19. TYPICAL CORROSION ON SKYLIGHT TUBE CURB CAP. NOTE LENS IS DISCOLORED.

20. TYPICAL REPAIRS TO POWER VENT CURB FLASHING

21. CORRODED FASTENERS IN RIDGE VENT

22. REPAIR AT STANDING SEAM PANEL CLIP LOCATION

23. REPAIR AT STANDING SEAM PANEL LAP SEAM

24. TYPICAL CORROSION ON GRAVITY VENT FLASHING

EXISTING ROOF CONDIITON | 6

D2.06 Remove site fencing and curb to this line as necessary for New Construction. Salvage Fence as directed by Owners. Prepare to receive new landscape.
D2.07 Remove Chain-link Fence and Gate; patch and prepare surface to receive new Fence and Gate
D2.09 Existing Site Fence and Gate to Remain
D2.10 Remove metal wall panels and metal stud walls, structure to remain
D2.11 Existing light pole to be removed; re: Electrical and Civil
D2.12 Existing light pole to remain; re: Electrical and Civil
D2.13 Remove and Clean up this area to receive new landscape; Re Landscape
D2.14 Remove all exterior light fixtures, camera and wall mounted objects to receive new exterior metal wall panel.
D2.15 Remove debris and clean up existing concrete floor to receive new flooring; re: finish plan
D2.29 Remove door and frame; patch and prepare surface for new construction
D2.31 Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.79 Remove column surround. Structure to remain.
D2.85 Remove metal soffit and sides. Patch and prepare surface for new construction
D2.86 Remove existing Louvered exhaust vent and prepare for new construction
D2.89 Existing light pole to be removed; re: Electrical
D2.91 Remove Window and Frame. Infill interior CMU wall for new construction

KEYNOTES | 5

JEFFERSON COUNTY DIVERSION CENTER
BRAVE ARCHITECTURE

1. JEFFERSON COUNTY DIVERSION CENTER DORMITORY, OVERALL VIEW

2. EVIDENCE OF PREVIOUS REPAIRS AND RENOVATIONS TO EXISTING METAL "R" PANEL WALLS

3. EVIDENCE OF PREVIOUS RENOVATIONS TO "R" PANELS. NOTE DOWNSPOUTS HAVE BEEN REMOVED.

4. TYPICAL CORROSION IN EXTERIOR WALL FASTENERS AND METAL FLASHING

5. TYPICAL CORROSION IN EXISTING METAL "R" PANELS

6. TYPICAL CORROSION IN EXISTING METAL "R" PANELS

EXISTING EXTERIOR CONDITIONS | 3

JEFFERSON COUNTY DIVERSION CENTER
BRAVE ARCHITECTURE

7. STEEL FLAME WINDOW WITH LAMINATED GLASS LITE AND STEEL STOP

8. MINOR CORROSION IN STEEL WINDOW FRAME AND STEEL STOP

9. STEEL WINDOW FRAME AND LAMINATED GLASS LITES

10. TYPICAL DISCOLORATION IN LAMINATED GLASS LITE PVB INTERLAYER

11. MINOR CORROSION IN STEEL TRIM AROUND CANOPY SOFFIT

12. DAMAGED METAL SOFFIT PANELS

EXISTING EXTERIOR CONDITIONS | 2

NOTES:

1. REFER TO DEMOLITION DRAWINGS FOR MORE INFORMATION.

GENERAL NOTES | 1

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DEMOLITION - SITE PHOTOS

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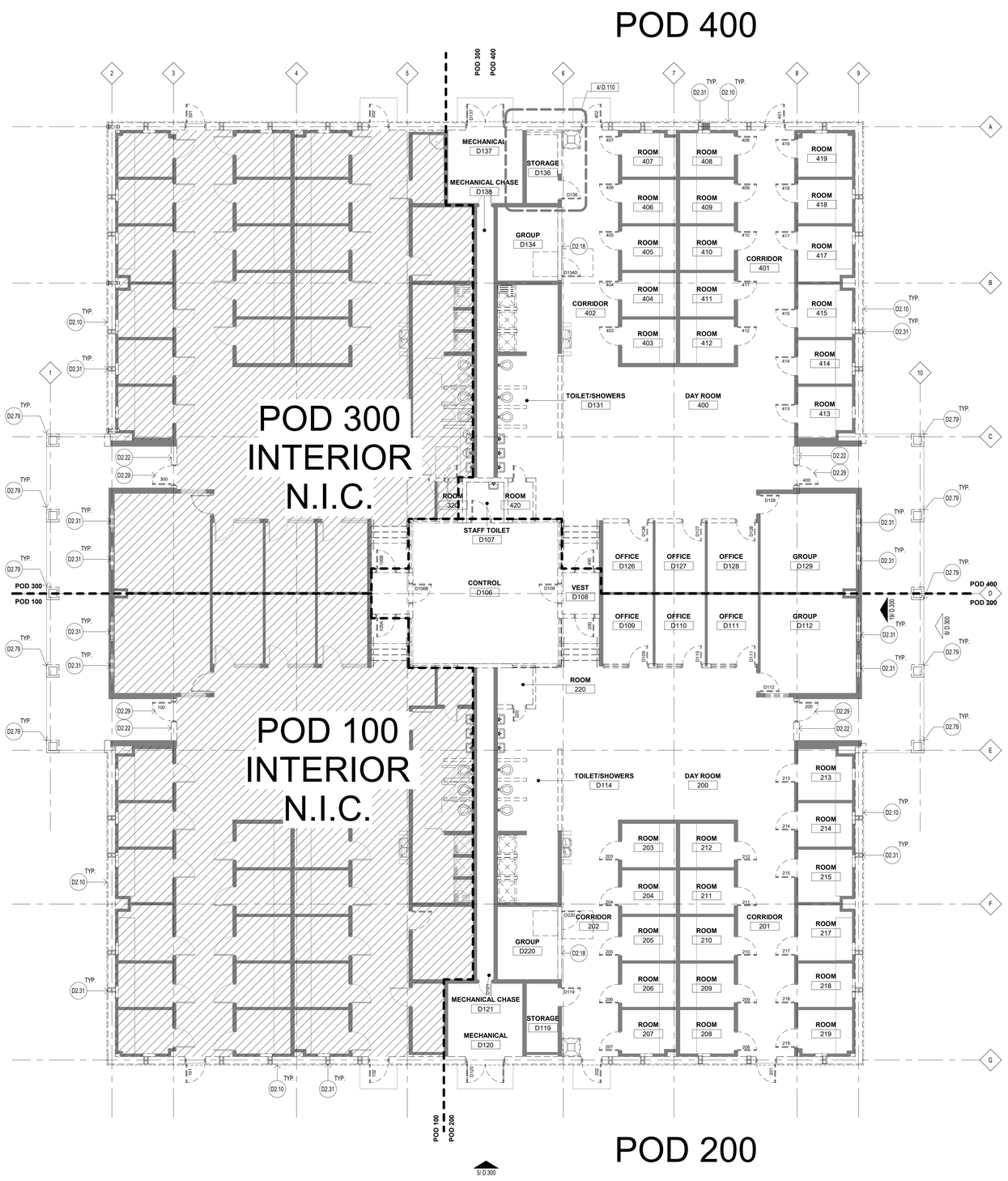
D.011



OVERALL DEMOLITION FIRST FLOOR PLAN | 1/8" = 1'-0" | 5

D2.10 Remove metal wall panels and metal stud walls, structure to remain
D2.18 Remove wall, door and window in this area to receive new hollow metal frame and door. Re: proposed floor plans.
D2.22 Remove wall finishes; patch and prepare surface for new construction
D2.29 Remove door and frame; patch and prepare surface for new construction
D2.31 Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.79 Remove column surround. Structure to remain.

KEYNOTES | 2

NOT IN SCOPE

EXISTING TO REMAIN

EXISTING TO BE DEMOLISHED

NOTES:
1. ALL UNIT DOORS TO BE REPLACED.
2. REF. D.110 FOR TYPICAL DEMOLITION NOTES FOR ALL PODS, U.N.O.

GENERAL NOTES | 1

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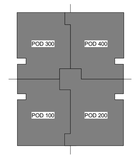

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DEMOLITION - OVERALL FLOOR PLAN

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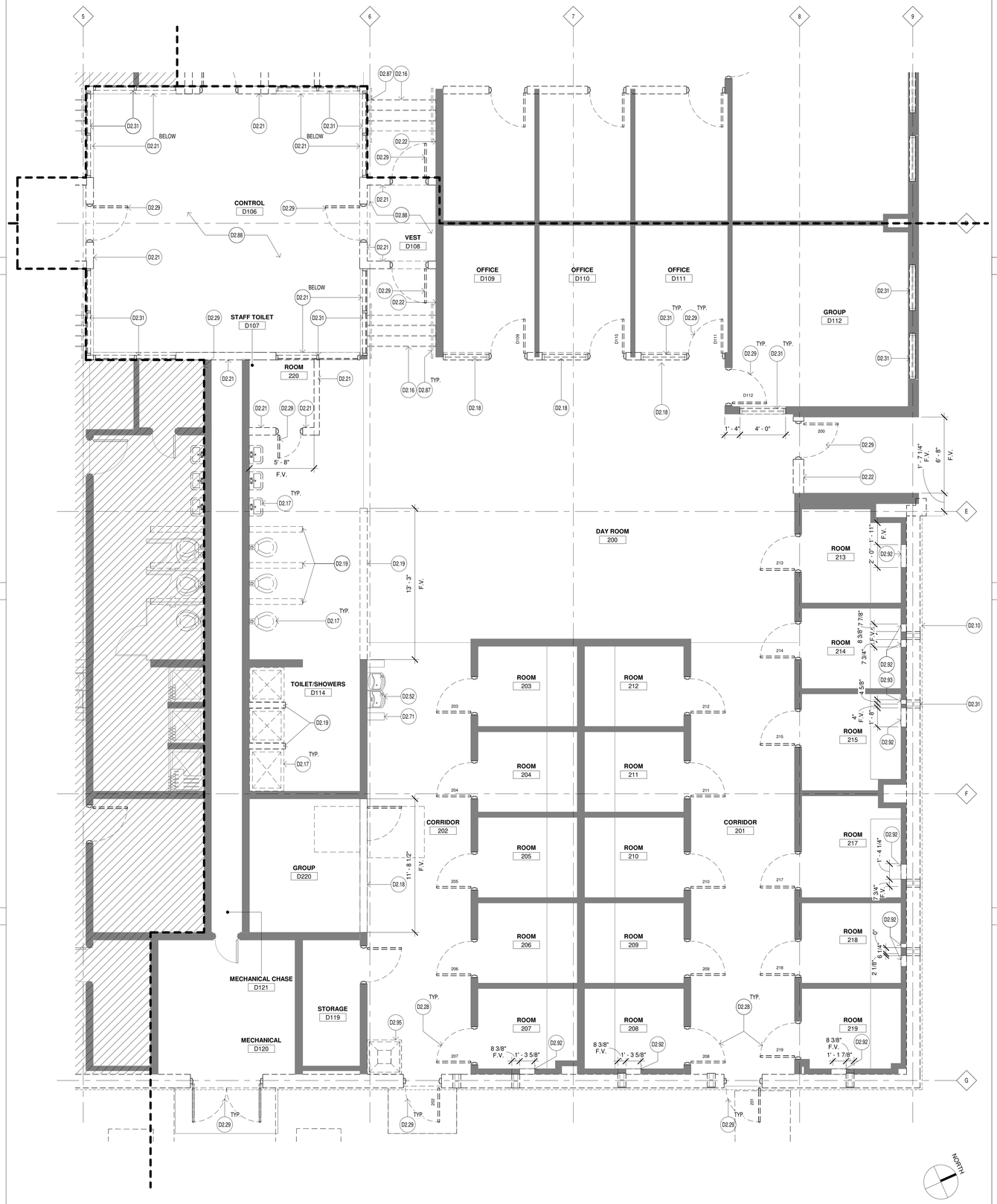
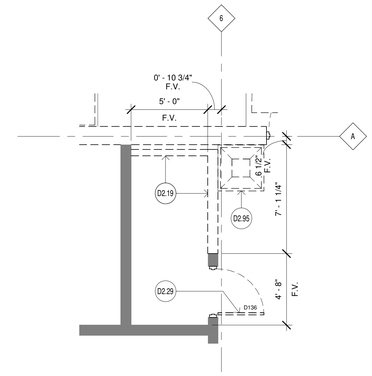
D.101



ENLARGED DEMOLITION FLOOR PLAN - POD B | 1/4" = 1'-0" | 5



ENLARGED FLOOR PLAN - D136 | 1/4" = 1'-0" | 4

D2.10 Remove metal wall panels and metal stud walls, structure to remain
D2.16 Remove stair; patch and prepare surfaces for new floor finishes
D2.17 Remove plumbing fixture as noted
D2.18 Remove wall, door and window in this area to receive new hollow metal frame and door. Re: proposed floor plans.
D2.19 Demo wall base, wall finish and wall where indicated; prepare for new construction
D2.21 Remove wall, wall base, and floor finishes
D2.22 Remove wall finishes; patch and prepare surface for new construction
D2.28 Remove door
D2.29 Remove door and frame; patch and prepare surface for new construction
D2.31 Remove window and frame, prepare for new windows, refer to floor plans for opening size
D2.52 Remove drinking fountain; prepare surface for new construction Re: MEP
D2.71 Existing wall to remain
D2.87 Remove railing; patch and prepare surface for new construction
D2.88 Remove floor finishes, platform and platform structure; patch and prepare surface for new floor finishes
D2.92 Remove interior CMU wall to receive new Window for new construction
D2.93 Infill interior CMU wall to receive new Window for new construcion
D2.95 Remove mop sink, cap and remove plumbing fixture and drain; patch and prepare surface for new construction

ENLARGED PLAN NOTES:

1. POD - 200 AS SHOWN ON THIS PLAN
2. POD - 400 IDENTICAL TO THIS PLAN UNO.

KEYNOTES | 2

NOT IN SCOPE

EXISTING TO REMAIN

EXISTING TO BE DEMOLISHED

NOTES:

1. TYPICAL DEMOLITION NOTES AT ALL PODS, U.N.O.
2. ALL UNIT DOORS TO BE REPLACED WITH TYPE 1, REFERENCE A.820
3. DEMO ON POD 400 IDENTICAL TO POD 200, U.N.O.

GENERAL NOTES | 1

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DEMOLITION - ENLARGED FLOOR PLAN POD 200

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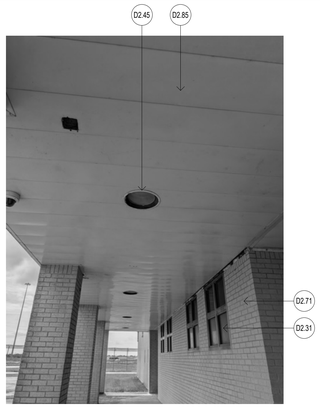


DEMO IMAGES - EXTERIOR ENTRY 2 | 12

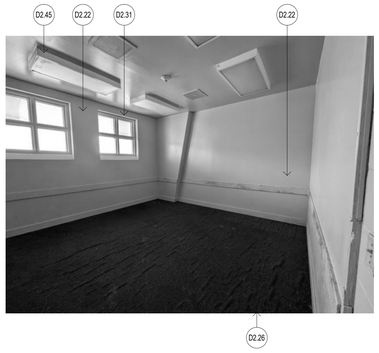
DEMO IMAGES - STAFF TOILET | 8

DEMO IMAGES - CONTROL ROOM | 4

DEMO IMAGES - EXTERIOR ENTRY | 11

DEMO IMAGES - WASHER/DRYER | 7

DEMO IMAGES - PLATFORM STAIRS | 3



DEMO IMAGES - GROUP ROOM | 14

DEMO IMAGES - EXTERIOR | 10

DEMO IMAGES - TOILET/SHOWERS | 6

D2.08 Remove concrete walk as indicated
D2.10 Remove metal wall panels and metal stud walls, structure to remain
D2.16 Remove stair; patch and prepare surfaces for new floor finishes
D2.17 Remove plumbing fixture as noted
D2.22 Remove wall finishes; patch and prepare surface for new construction
D2.23 Remove wall base finishes; patch and prepare surface for new construction
D2.25 Remove flooring
D2.26 Remove floor finishes; patch and prepare surface for new construction
D2.29 Remove door and frame; patch and prepare surface for new construction
D2.31 Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.34 Remove, protect, prepare for replacement tubular daylighting device
D2.37 Remove millwork
D2.42 Remove ceiling tiles and grid system
D2.43 Replace damaged ceiling tiles to match existing
D2.44 Remove gypsum board ceiling and support system
D2.45 Remove light fixture
D2.47 Remove mop sink
D2.55 Remove restroom accessories
D2.71 Existing wall to remain
D2.73 Existing window to remain, reseal window and glazing
D2.84 Remove security cameras
D2.85 Remove metal soffit and sides. Patch and prepare surface for new construction
D2.88 Remove floor finishes, platform and platform structure; patch and prepare surface for new floor finishes

KEYNOTES | 2

DEMO IMAGES - SLEEPING UNIT | 13

DEMO IMAGES - CORRIDOR 2 | 9

DEMO IMAGES - CORRIDOR | 5

NOTES:

1. REFER TO DEMOLITION PLANS FOR MORE INFORMATION.

LEGEND | 1

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14293
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DEMOLITION - INTERIOR PHOTOS

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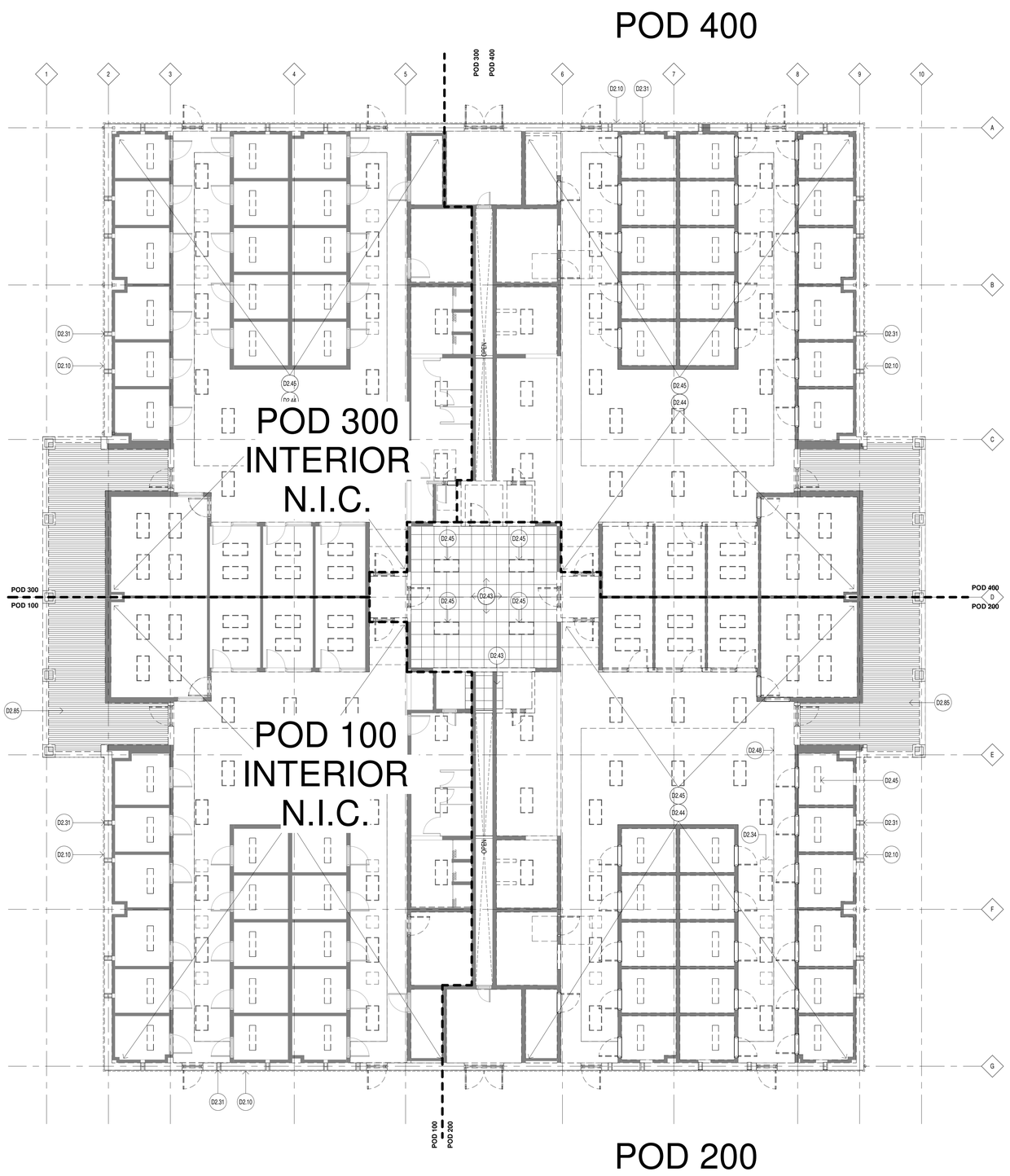

OVERALL DEMOLITION REFLECTED CEILING PLAN 1/8" = 1'-0" 5

D2.10	Remove metal wall panels and metal stud walls, structure to remain
D2.31	Remove window and frame, prepare for new windows, refer to floor plans for opening size
D2.34	Remove, protect, prepare for replacement tubular daylighting device
D2.43	Replace damaged ceiling tiles to match existing
D2.44	Remove gypsum board ceiling and support system
D2.45	Remove light fixture
D2.48	Remove furr-out to structure
D2.85	Remove metal soffit and sides. Patch and prepare surface for new construction

KEYNOTES 2

LEGEND 1

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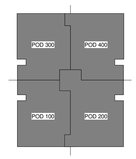

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05/02/2024	SCHEMATIC DESIGN
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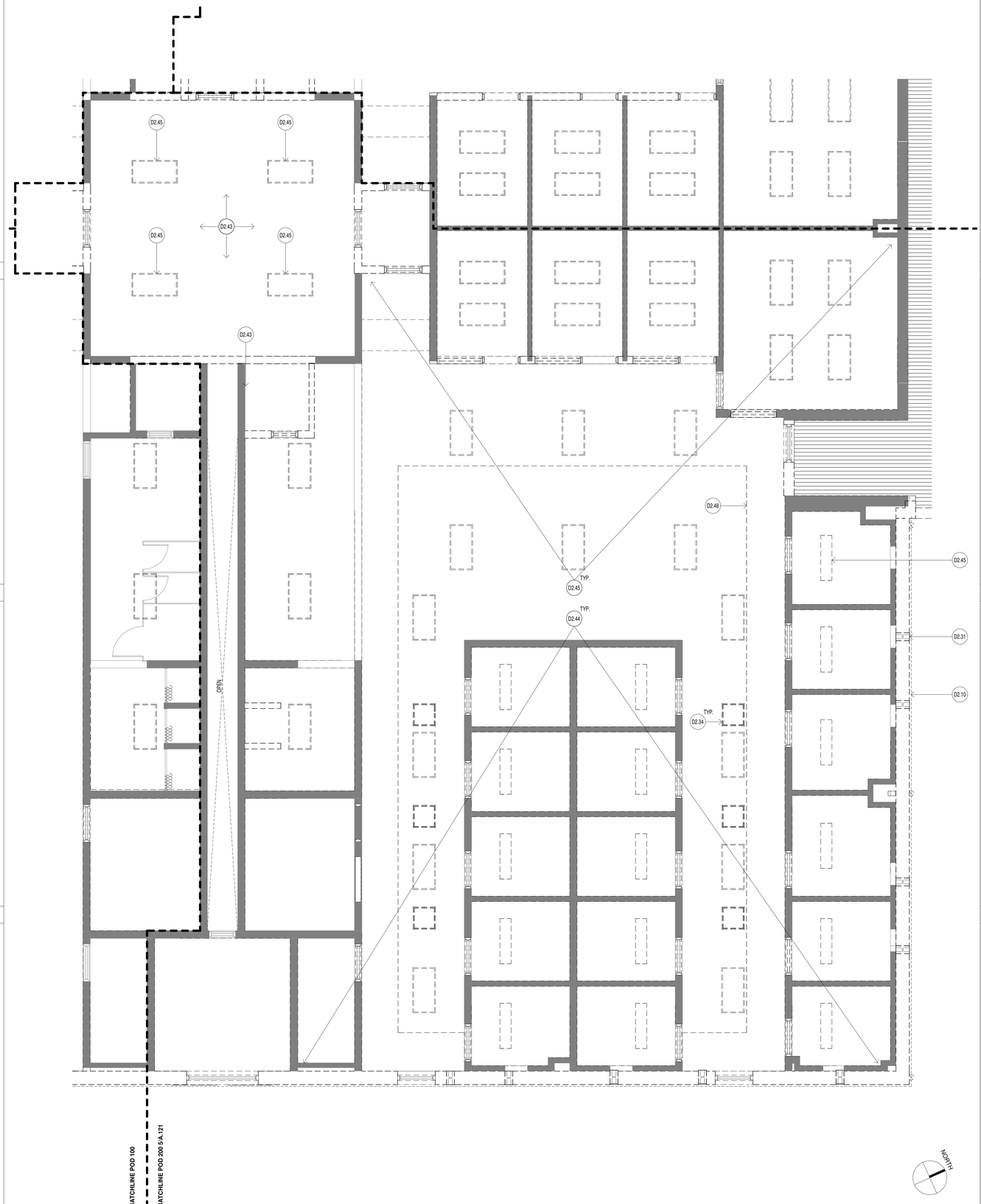
DEMOLITION - OVERALL REFLECTED CEILING PLAN

Scale: AS NOTED

D.121



OVERALL DEMOLITION REFLECTED CEILING PLAN 1/4" = 1'-0" 5

D2.10 Remove metal wall panels and metal stud walls, structure to remain
D2.31 Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.34 Remove, protect, prepare for replacement tubular daylighting device
D2.43 Replace damaged ceiling tiles to match existing
D2.44 Remove gypsum board ceiling and support system
D2.45 Remove light fixture
D2.48 Remove furr-out to structure

KEYNOTES 2

NOTES:
1. TYPICAL DEMOLITION NOTES AT ALL PODS, U.N.O.

LEGEND 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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KEYPLAN:

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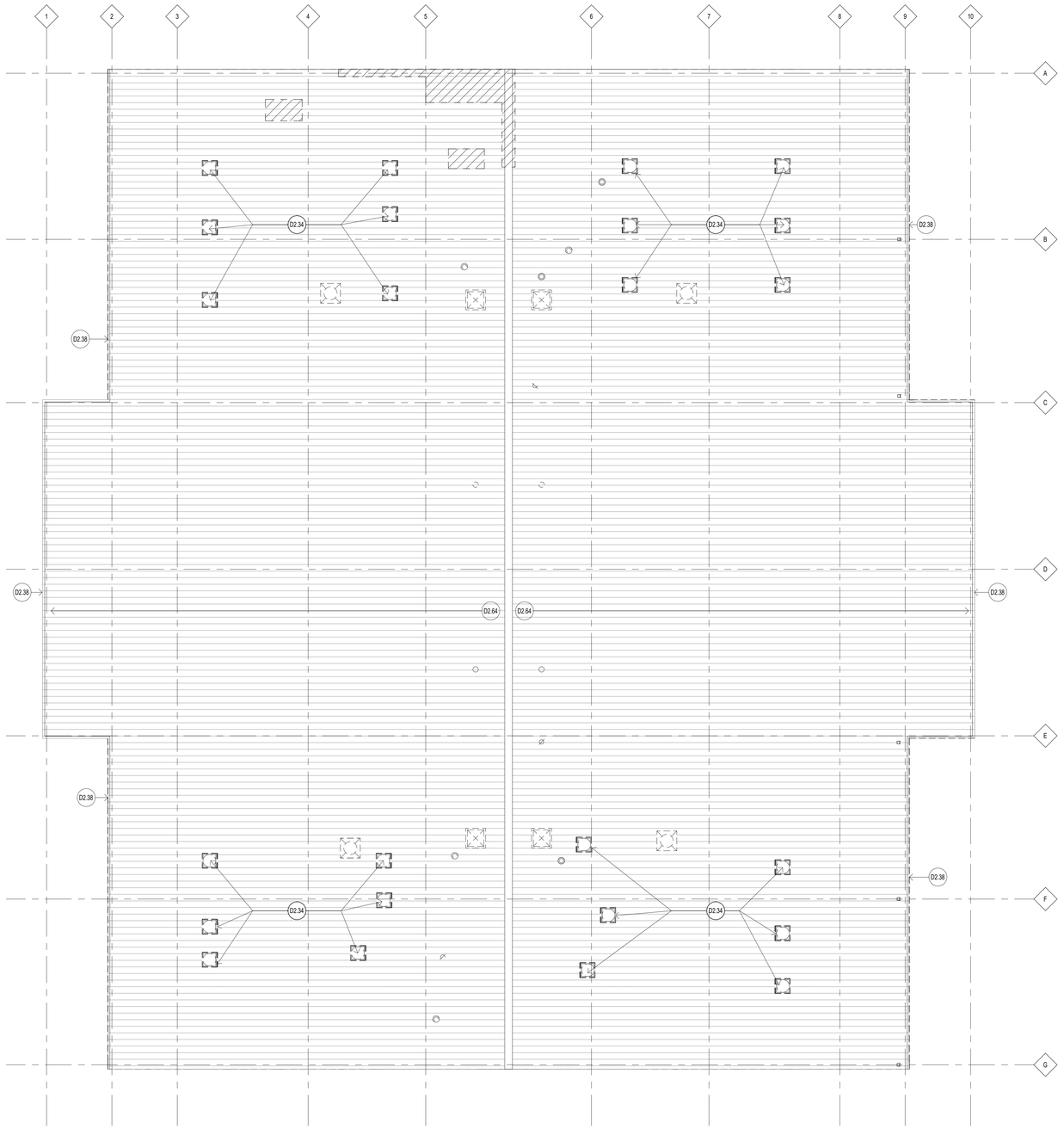
DEMOLITION - ENLARGED REFLECTED CEILING POD 200

Scale: AS NOTED

D.125



OVERALL DEMOLITION ROOF PLAN 1/8" = 1'-0" 5

SOLAR TUBE

CURBED GRAVITY VENT

CURBED POWER VENT

EXISTING DAMAGED RIDGE, ROOF PANELS, RAKE EDGE FLASHING TO BE REPLACED. GC TO FIELD VERIFY EXTENT OF DAMAGED ROOF.

PIPE VENT

GRAVITY VENT

PLUMBING VENT

ROOF DEMOLITION LEGEND 1/8" = 1'-0"

D2.34 Remove, protect, prepare for replacement tubular daylighting device
D2.38 Remove existing gutters and prepare for new gutters
D2.64 Roof to remain

KEYNOTES 2

NOTES:
1. REPLACE DAMAGED RIDGE, ROOF PANEL AND RAKE EDGE FLASHING.
2. INSTALL RECOVERY ROOF AS PER SPECIFICATIONS AND DETAILS OVER THE EXISTING ROOF.
3. EXISTING PENETRATIONS SHOWN FOR REFERENCE ONLY. GC TO VERIFY ALL EXISTING LOCATIONS PRIOR TO INSTALLING NEW ROOFING SYSTEM.
4. NEW ROOFING SYSTEM TO ALSO TAKE ACCOUND OF NEW PANETRATIONS.

LEGEND 1

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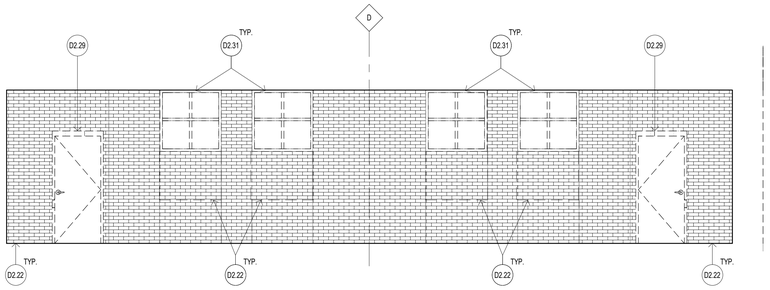
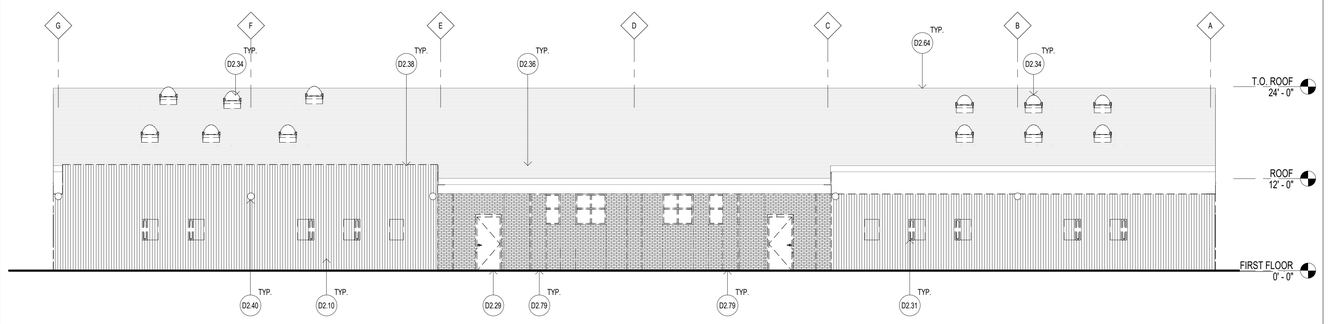
DEMOLITION - ROOF PLAN

Scale: AS NOTED

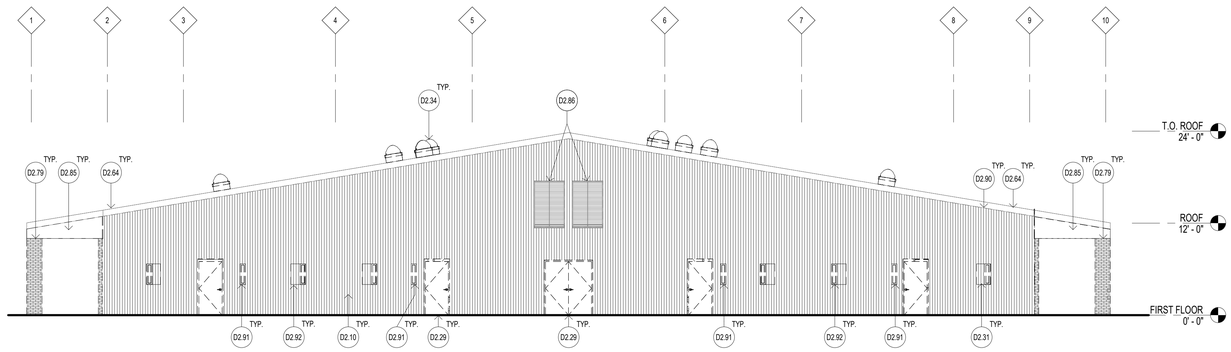
D.200



EAST ENTRY ELEVATION DEMO (WEST SIM) 1/4" = 1'-0" 19



EAST ELEVATION DEMO (WEST SIM) 1/8" = 1'-0" 6



SOUTH ELEVATION DEMO (NORTH SIM) 1/8" = 1'-0" 5

KEYNOTES 2

D2.10	Remove metal wall panels and metal stud walls, structure to remain
D2.22	Remove wall finishes; patch and prepare surface for new construction
D2.29	Remove door and frame; patch and prepare surface for new construction
D2.31	Remove window and frame, prepare for new windows. refer to floor plans for opening size
D2.34	Remove, protect, prepare for replacement tubular daylighting device
D2.36	Remove covered canopy as indicated; remove structure to nearest beam and column
D2.38	Remove existing gutters and prepare for new gutters
D2.40	Remove downspouts
D2.64	Roof to remain
D2.79	Remove column surround. Structure to remain.
D2.85	Remove metal soffit and sides. Patch and prepare surface for new construction
D2.86	Remove existing Louvered exhaust vent and prepare for new construction
D2.90	Existing light pole to remain; re: Electrical
D2.91	Remove Window and Frame. Infill interior CMU wall for new construction
D2.92	Remove interior CMU wall to receive new Window for new construction

LEGEND 1

NOTES:

1. ALL EXTERIOR DOORS TO BE REMOVED AND REPLACED
2. ALL EXTERIOR METAL PANEL, SHEATHING, AND INSULATION TO BE REMOVED
3. EXISTING INTERIOR PARTITIONS TO REMAIN U.N.O.
4. EXISTING METAL BUILDING FRAME TO REMAIN
5. EXISTING LIGHT FIXTURES, CAMERAS, ELECTRICAL & GAS LINE PANETRATIONS TO BE PROTECTED AND REUSED AS NEEDED FOR NEW CONSTRUCTION.

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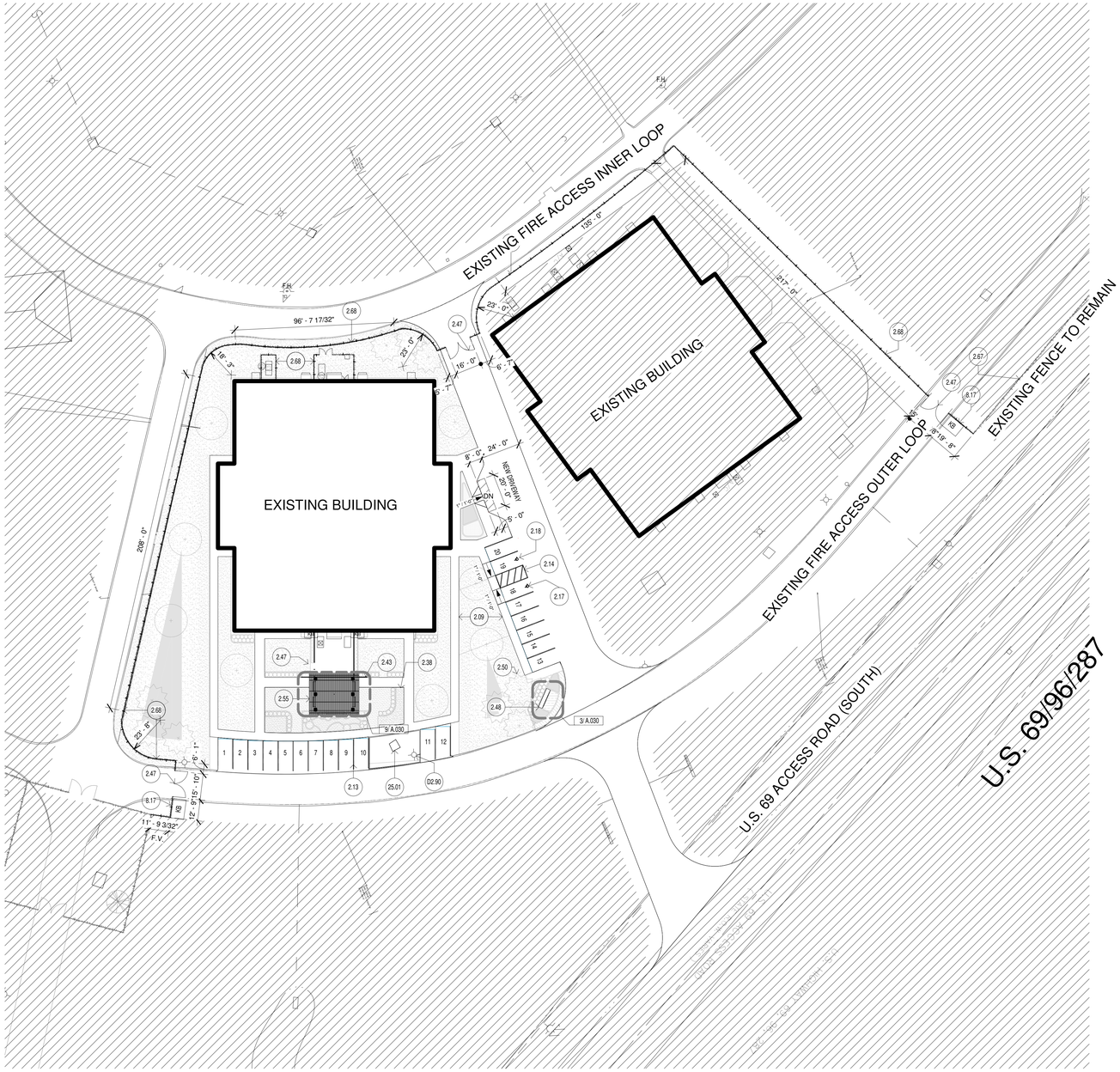
DEMOLITION - EXTERIOR ELEVATION

Scale: AS NOTED

D.300



PROPOSED SITE PLAN 1/32" = 1'-0" 5

NORTH

2.09	New concrete paving; re: Civil for layout of paving expansion joints and control joints
2.13	Parking stripes: 4" wide, white
2.14	Diagonal striping; 4" wide at 2'-0" O.C., white
2.17	Accessible parking stall with signage; re: 13/A.040 and 15/A.040
2.18	Van Accessible parking stall with signage; re: 15/A.040
2.38	Gravel landscape
2.43	8'-0' high treated wood fence
2.47	Double gate, reference plans and schedules for width and hardware. Provide gate latch with padlock and cane bolts.
2.48	Monument sign, re: Structural, Electrical & IT for connection coordination
2.50	New tree; re: Landscape
2.55	30' x 20' pre-engineered trellis shade structure, re: Structural
2.67	Existing fence
2.68	New fence
8.17	Knox box, re: Specifications
25.01	Approximate location of electrical service connection and meter; re: Civil and Electrical
D2.90	Existing light pole to remain; re: Electrical

KEYNOTES 2

NOT IN SCOPE

EXISTING SIDEWALK TO BE DEMOLISHED

EXISTING FENCE TO REMAIN

EXISTING FENCE TO BE DEMOLISHED

F.H. EXISTING FIRE HYDRANT

GENERAL NOTES:

1. ADD CONCRETE SPLASH BLOCK AT EVERY ROOF DRAIN. LOCATION TO BE ALIGNED WITH ROOF DRAIN NOZZLE. RE: ROOF PLAN FOR QUANTITY AND LOCATION

GENERAL NOTES 1

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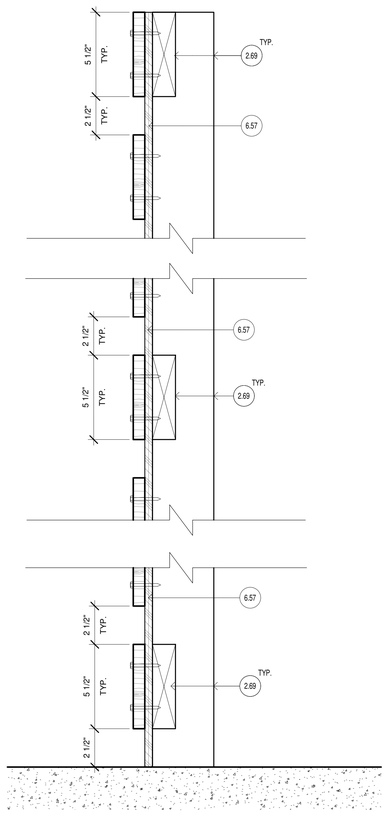
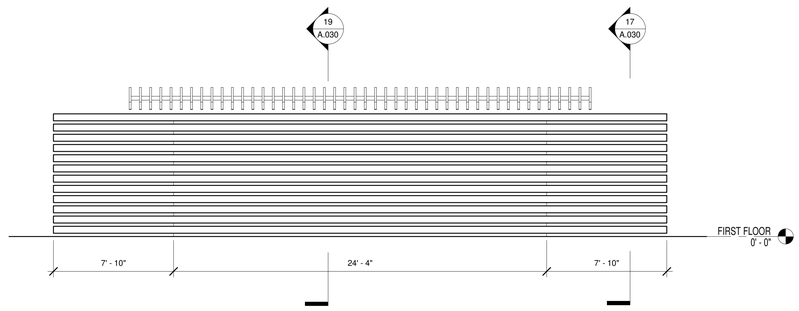
SITE PLAN

Scale: AS NOTED

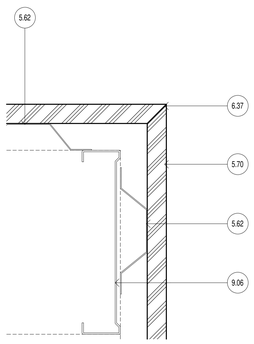
A.010



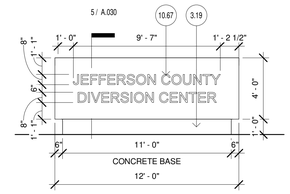
SECTION @ FENCE WITH BACK PANEL 3" = 1'-0" | 19



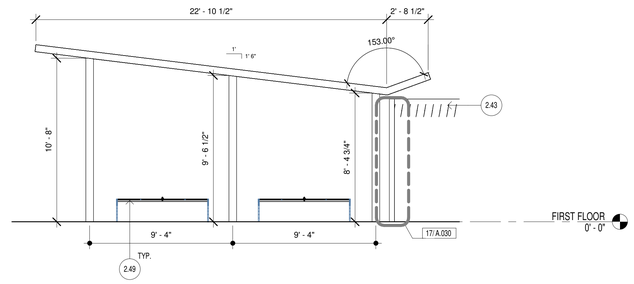
TRELLIS FENCE NORTH ELEVATION 1/4" = 1'-0" | 12



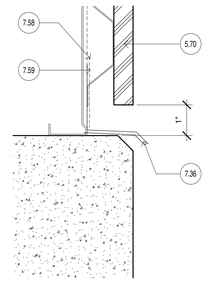
MONUMENTAL SIGN TOP CORNER 6" = 1'-0" | 8



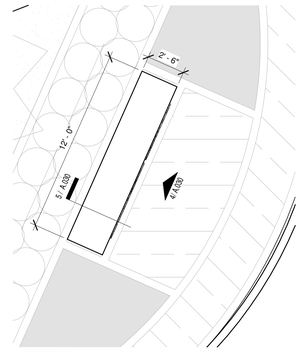
MONUMENTAL SIGN FRONT ELEVATION 1/4" = 1'-0" | 4



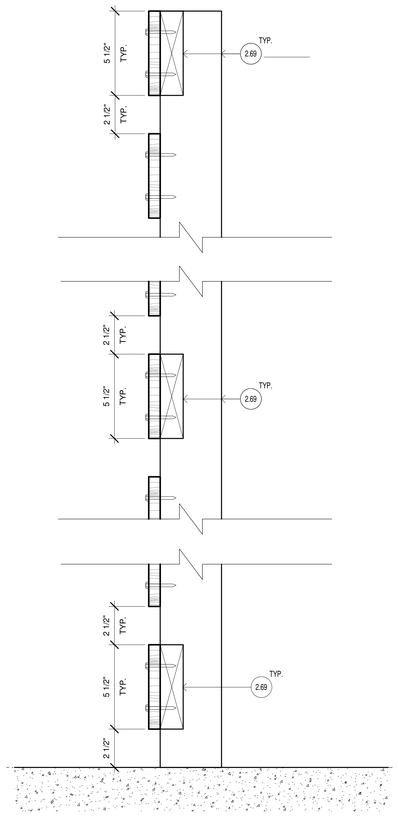
TRELLIS SHADE STRUCTURE EAST ELEVATION 1/4" = 1'-0" | 11



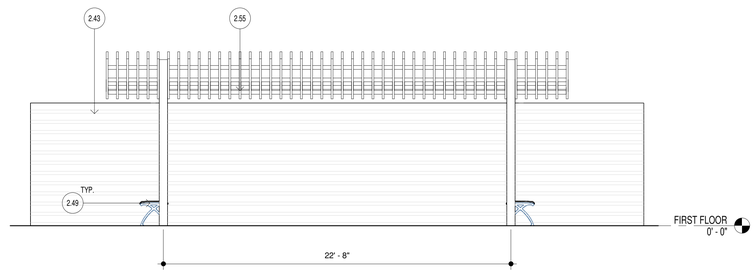
MONUMENTAL SIGN BOTTOM CORNER 6" = 1'-0" | 7



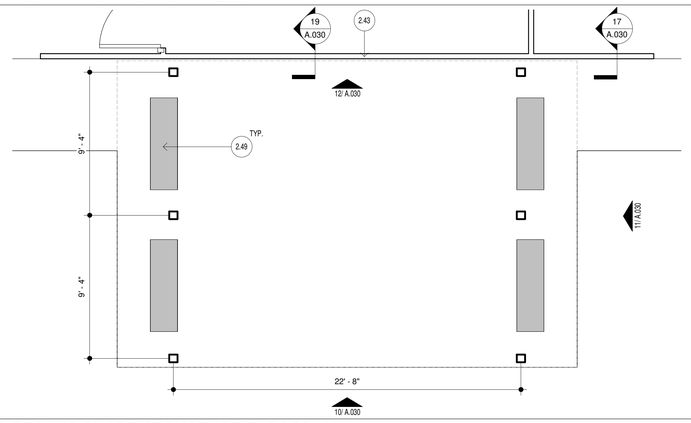
ENLARGED MONUMENTAL SIGN PLAN 1/4" = 1'-0" | 3



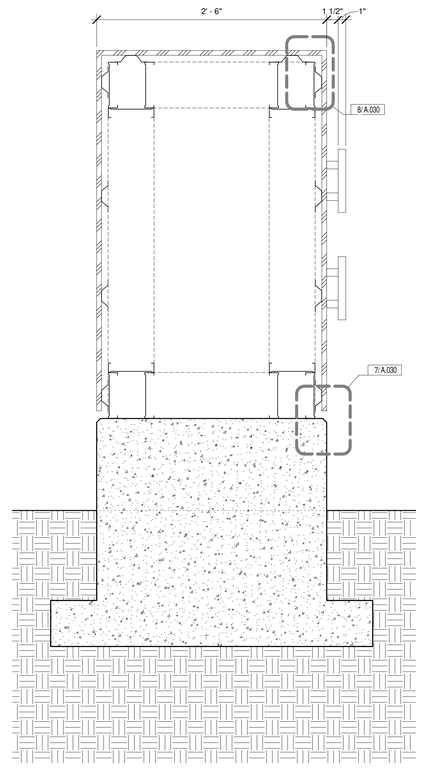
SECTION @ FENCE 3" = 1'-0" | 17



TRELLIS SHADE STRUCTURE NORTH ELEVATION 1/4" = 1'-0" | 10



ENLARGED TRELLIS SHADE STRUCTURE FLOORPLAN 1/4" = 1'-0" | 9



MONUMENT SIGN SECTION 1 1/2" = 1'-0" | 5

2.43	8'-0" high treated wood fence
2.49	Bench, re: Plans and Landscape
2.55	30' x 20' pre-engineered trellis shade structure, re: Structural
2.69	Treated 6'-0" high cedar wood fence and gate (s). 1"x6"x3/4" cedar boards with 2"x6" top soil support. 4"x4" posts @ 6'-0" O.C. max. Provide galvanized screws and washers. Gate opening to be located as shown on drawings and be 8'-0" clear, gates to fit opening shall have self-closing mechanisms and locking devices & Knox boxes.
3.19	Cast in place concrete wall. Architectural concrete finish on all exposed concrete surfaces; re: structural & specs
5.62	7/8" Hat channel
5.70	5/8" thick aluminum monument panel; powder coated paint finish
6.37	Miter edges
6.57	1/2" Plywood back panel
7.36	Metal trim flashing
7.58	Fluid applied air and water barrier
7.59	Self-adhered air and water barrier
9.06	6" exterior wall metal studs at 16" O.C. Maximum
10.67	1" deep channel letters with 316 brushed stainless-steel face and sides; mounted 1.5" standoff spacers fastened to the monument sign aluminum panel. letters to have clear Lexan / Polycarbonate backing

KEYNOTES 2

GENERAL NOTES 1

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STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: EB
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ENLARGED SITE PLAN

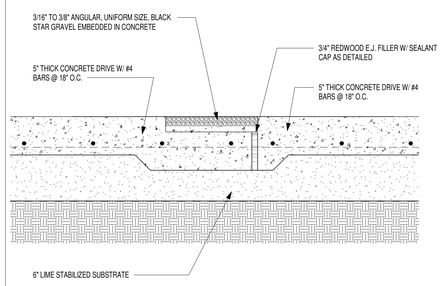
Scale: AS NOTED

A.030

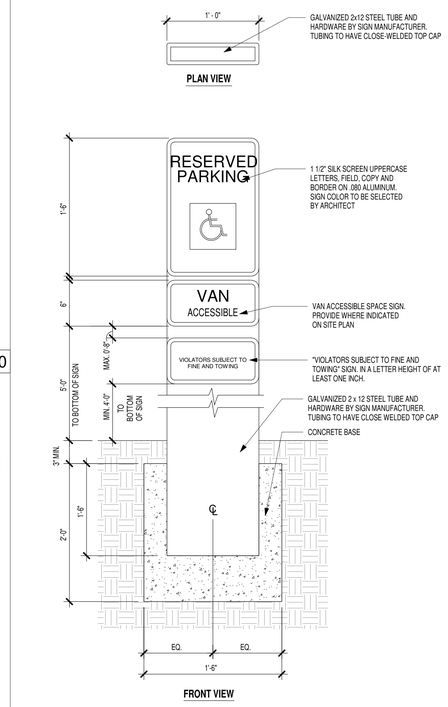
AREA	CONCRETE THICKNESS	REINFORCING
AUTO DROP-OFF & VISITORS PARKING	5"	#3 BARS @ 15" O.C. EACH WAY
FACULTY PARKING (NON - SHADED)	5"	#3 BARS @ 15" O.C. EACH WAY
BUS DROP-OFF, SERVICE YARD & DRIVES (SHADED AREA)	7"	#3 BARS @ 12" O.C. EACH WAY
SIDEWALKS AND ENTRY WALKS	4"	6 X 6 #6 W.W.M. FLAT (NOT ROLLED)
PAVED PLAY AREA	4 1/2"	#3 BARS @ 18" O.C. EACH WAY

NOTE: SAND SHALL NOT BE USED AS A SUBGRADE MATERIAL IN LIEU OF STABILIZED SAND BELOW VEHICULAR PAVING.

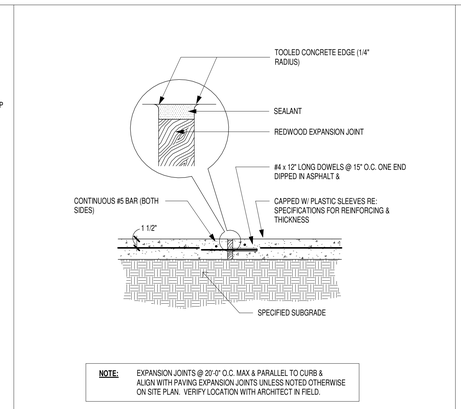
CONCRETE PAVING REINFORCEMENT SCHEDULE 20



TYP. GRAVEL INSERT DETAIL @ BREEZEWAY 19

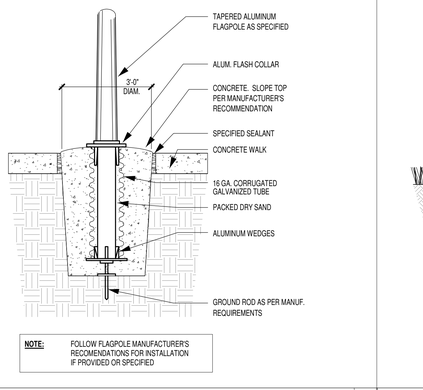


ACCESSIBLE PARKING SIGN 15



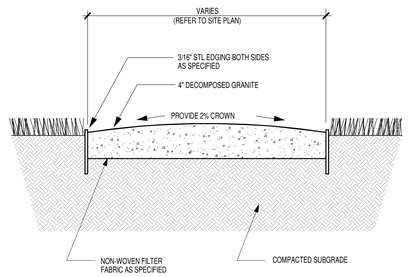
NOTE: EXPANSION JOINTS @ 20'-0" O.C. MAX & PARALLEL TO CURB & ALIGN WITH PAVING EXPANSION JOINTS UNLESS NOTED OTHERWISE ON SITE PLAN. VERIFY LOCATION WITH ARCHITECT IN FIELD.

CONCRETE WALK EXPANSION JOINT 12

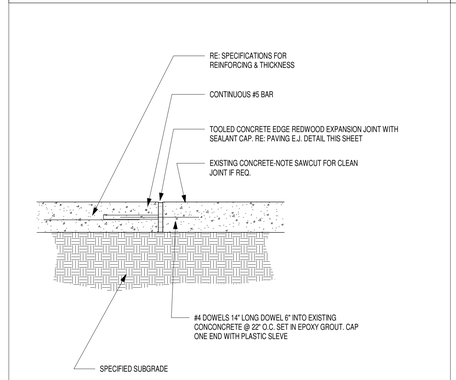


NOTE: FOLLOW FLAGPOLE MANUFACTURER'S RECOMENDATIONS FOR INSTALLATION IF PROVIDED OR SPECIFIED

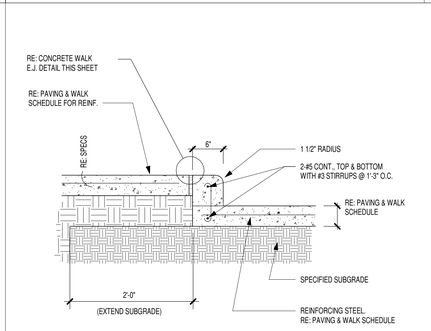
FLAG POLE BASE DETAIL 8



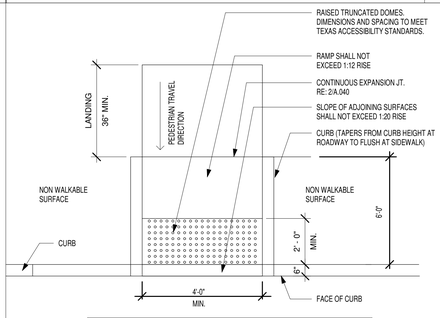
DECOMPOSED GRANITE TRAIL SECTION 4



NEW CONCRETE WALK @ EXISTING 11

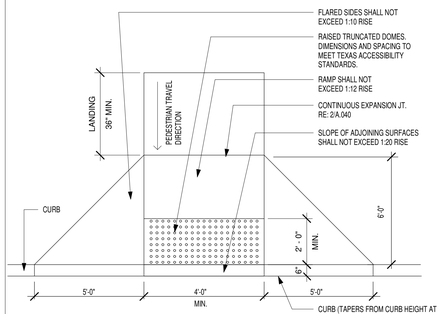


CONC. WALK @ NEW/EXISTING CONCRETE CURB 7



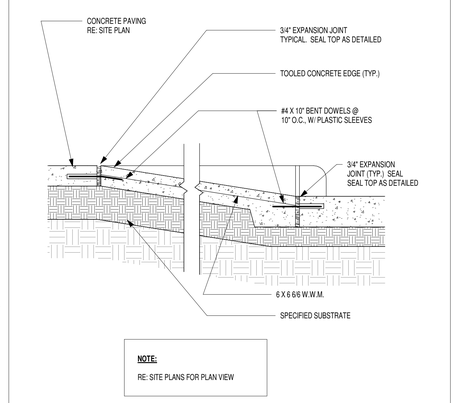
NOTE:
1. RAMPS SHALL BE OF CONTRASTING COLOR WITH COLOR ADDITIVE ADDED TO CONCRETE. RE: CIVIL
2. RE: SITE PLAN FOR PLAN VIEWS

CONCRETE ACCESSIBLE RAMP PLAN 3/8" = 1'-0" 3



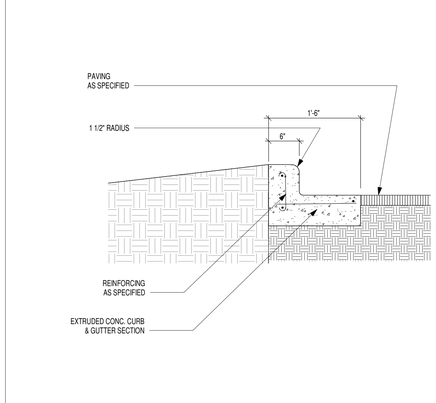
NOTE:
1. RAMPS SHALL BE OF CONTRASTING COLOR WITH COLOR ADDITIVE ADDED TO CONCRETE. RE: CIVIL
2. RE: SITE PLAN FOR PLAN VIEWS

CONCRETE ACCESSIBLE RAMP PLAN 14

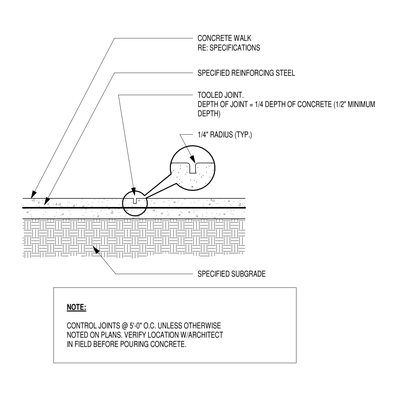


NOTE:
RE: SITE PLANS FOR PLAN VIEW

CONCRETE ACCESSIBLE RAMP SECTION 10

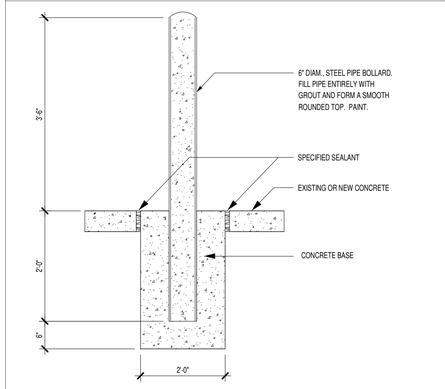


CONCRETE CURB @ PAVING 6

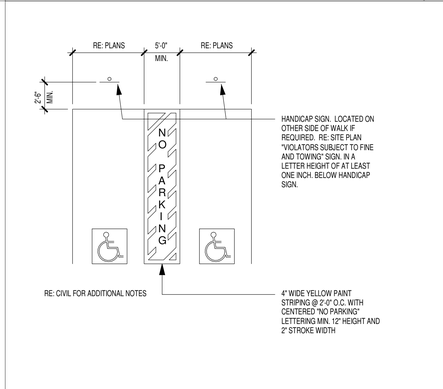


NOTE:
CONTROL JOINTS @ 5'-0" O.C. UNLESS OTHERWISE NOTED ON PLANS. VERIFY LOCATION W/ARCHITECT IN FIELD BEFORE POURING CONCRETE.

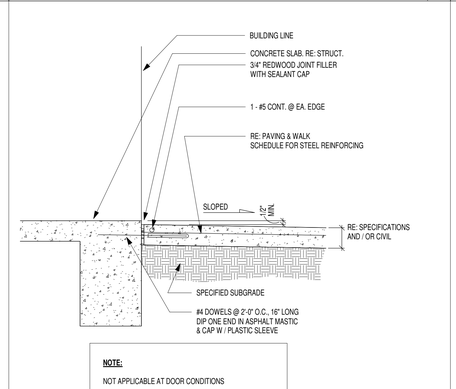
CONCRETE WALK CONTROL JOINT 2



PIPE BOLLARD 17

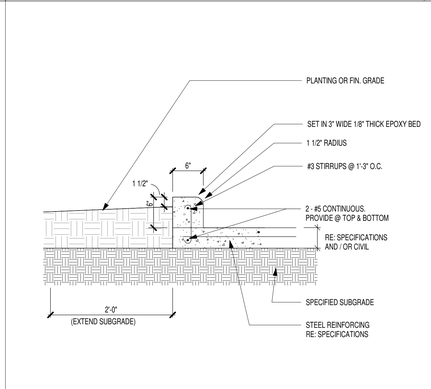


ACCESSIBLE PARKING STALL 13

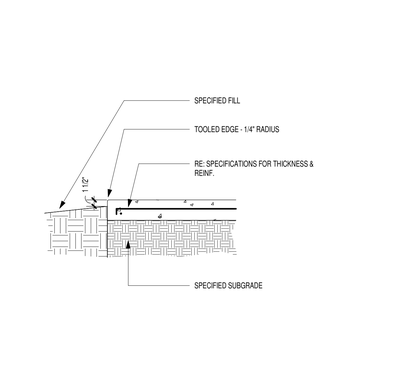


NOTE:
NOT APPLICABLE AT DOOR CONDITIONS

CONCRETE WALK @ BUILDING EDGE 9



CONCRETE CURB @ LANDSCAPE 5



CONCRETE WALK @ LANDSCAPE 1

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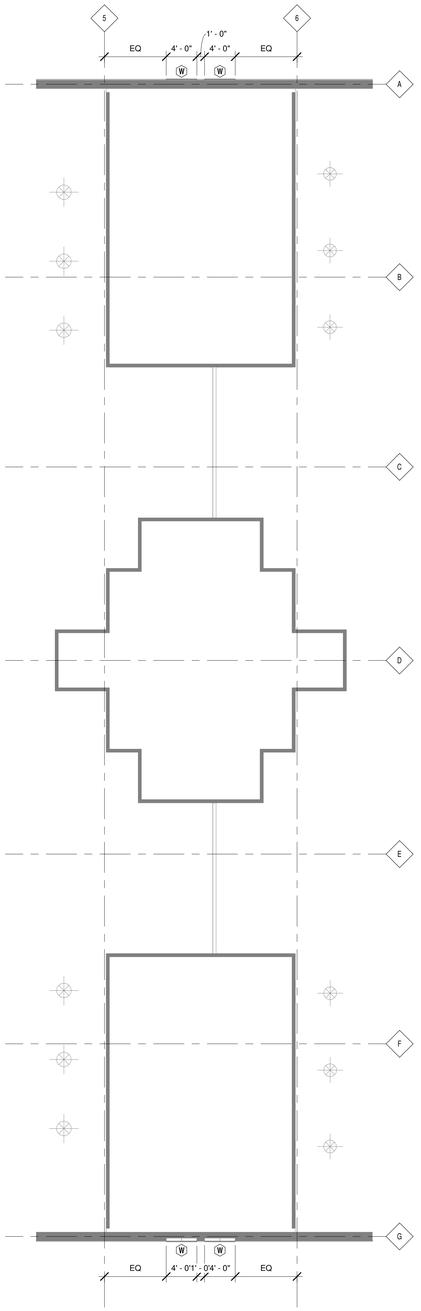
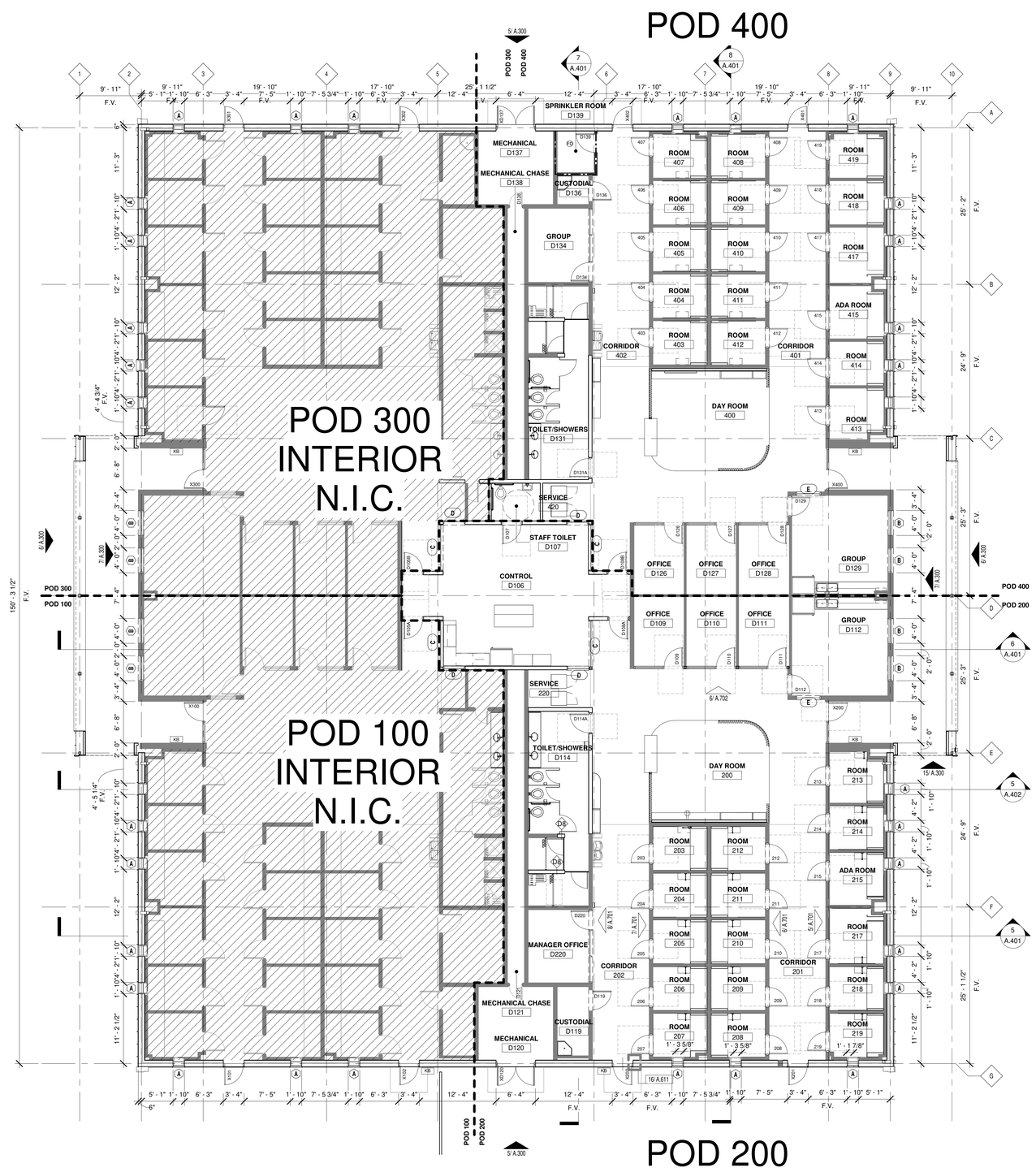
SITE DETAILS

Scale: AS NOTED

A.040





ROOF DRAIN NOTE:

1. ADD CONCRETE SPLASH BLOCK AT EVERY ROOF DRAIN. LOCATION TO BE ALIGNED WITH ROOF DRAIN NOZZLE. RE: ROOF PLAN FOR QUANTITY AND LOCATION

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:
METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

KEYNOTES 2

NOT IN SCOPE

EXISTING WALLS

NEW CONSTRUCTION

MATCH LINES

NOTES:

1. EXTERIOR WORK INCLUDES NEW WALL CONSTRUCITON, NEW WALL METAL PANELS, NEW RECOVERY ROOFING SYSTEM, NEW WINDOWS AND NEW EXTERIOR DOORS OF THE ENTIRE BUILDING.
2. INTERIOR BUILDING OUT INCLUDES UPGRADING INTEIROR WALL AND FINISHES OF POD 200 AND POD 400 INCLUDING CONTROL ROOM, ALL MECHANICAL SPACES AND MEZZANINE FLOOR.
3. SPRINKER HEAD INSTALLATION AND RELATED WORK INCLDUED FOR ENTIRE BUILDING. PHASE I INCLUDES EXTERIOR
4. REFERENCE A.110 FOR TYPICAL NEW CONSTRUCTION NOTES, U.N.O.
5. ALL DIMENSIONS TO BE FIELD VERIFIED

MECHANICAL MEZZANINE 1/8" = 1'-0" 17

OVERALL FIRST FLOOR PLAN 1/8" = 1'-0" 5

LEGEND 1

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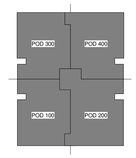
KEYPLAN:



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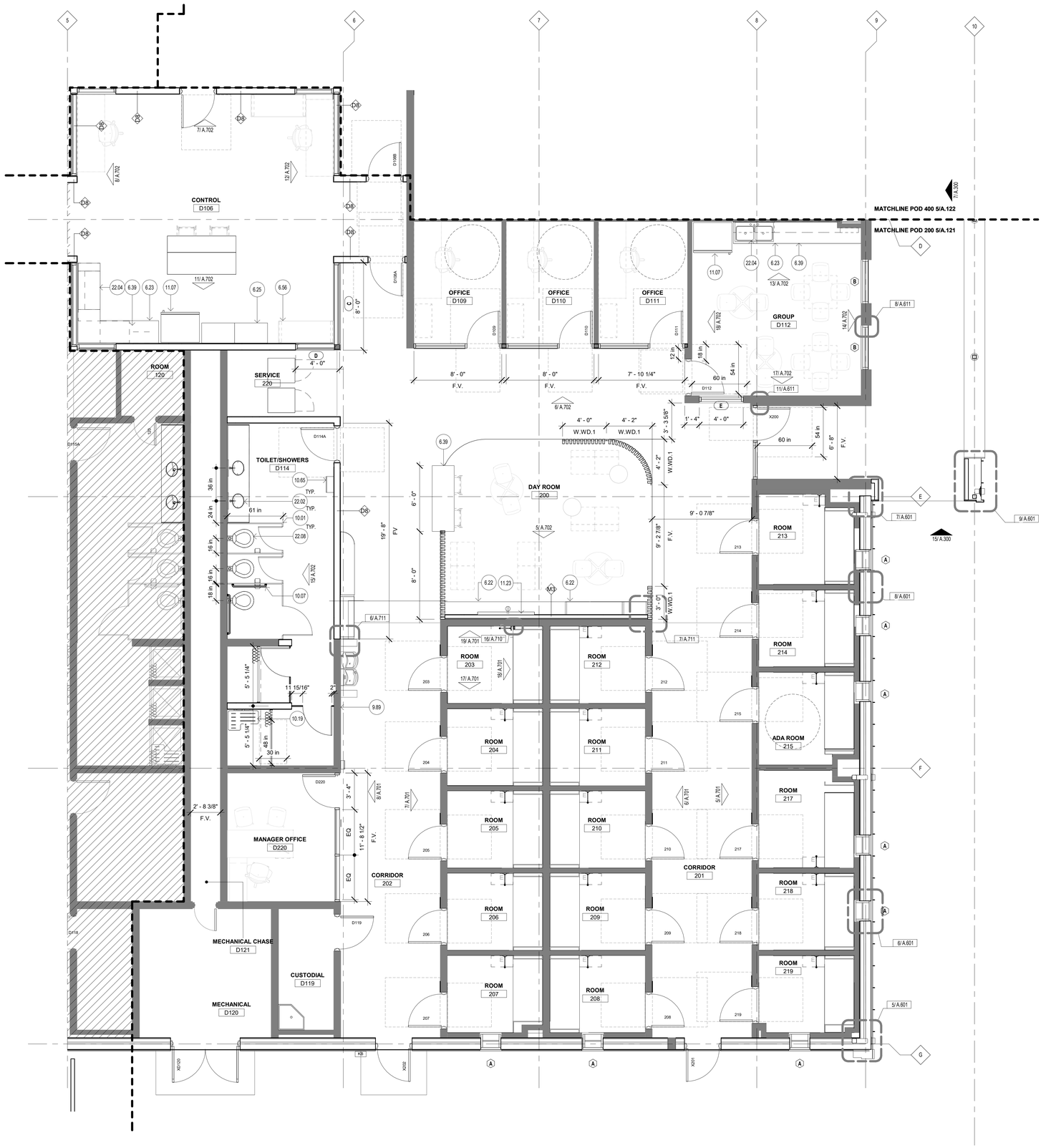
OVERALL FLOOR PLAN

Scale: AS NOTED

A.100



ENLARGED FLOOR PLAN - POD 200 | 1/4" = 1'-0" | 5

6.22	Millwork; re: Millwork details
6.23	Base cabinets; re: Millwork details
6.25	Tall cabinets; re: Millwork details
6.39	Countertop; re: Millwork details & Finish schedule
6.56	Desk - Furniture Owner Provided Owner Installed
9.89	Existing wall; Field verify
10.01	Toilet partition(s) ; re: Accessory schedule
10.07	Grab bar, 36" long, re: Accessory schedule
10.19	Folding shower seat, re: Accessory schedule
10.65	Surface mounted waste receptacle, re: Toilet Accessories Schedule
11.07	Refrigerator - Owner Provided Contractor Installed
11.23	Wall-mounted flat panel television
22.02	Counter-mount lavatory; re: Plumbing
22.04	Two-compartment sink; re: Plumbing
22.08	Wall-mount water closet; re: Plumbing

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

KEYNOTES | 2

NOT IN SCOPE

EXISTING WALLS

NEW CONSTRUCTION

MATCH LINES

ENLARGED PLAN NOTES:

1. POD - 200 AS SHOWN
2. POD - 400 IDENTICAL TO POD 200 UNO.

NOTES:

1. REFER TO TYPICAL NOTES FOR NEW CONSTRUCTION IN ALL PODS, U.N.O.
2. FURNITURE SHOWN FOR REFERENCE ONLY AND TO BE PROVIDED BY OWNER
3. ALL DIMENSIONS TO BE FIELD VERIFIED

LEGEND | 1

JC DIVERSION CENTER RENOVATION

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ENLARGED FLOOR PLAN - POD 200

Scale: AS NOTED

A.101

ENLARGED FLOOR PLAN - POD 200 | 1/4" = 1'-0" | 5

10.06	Grab bar, 42" long, re: Accessory schedule
10.07	Grab bar, 36" long, re: Accessory schedule
22.01	Wall-mount lavatory; re: Plumbing
22.08	Wall-mount water closet; re: Plumbing
22.15	Floor drain; re: Plumbing

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

KEYNOTES | 2

NOT IN SCOPE

EXISTING WALLS

NEW CONSTRUCTION

MATCH LINES

ENLARGED PLAN NOTES:

1. POD - 200 AS SHOWN
2. POD - 400 IDENTICAL TO POD 200 UNO.

NOTES:

1. POD 400 IS SIMILAR AS POD 200. ALL KEY NOTES, DIMENSIONS AND SCOPE OF WORK APPLIES FROM SHEET A.101, UNLESS NOTED OTHERWISE. REFER TO SHEET A.101 FOR CONTROL ROOM INFORMATION.
2. REFER TO TYPICAL NOTES FOR NEW CONSTRUCTION IN ALL PODS, U.N.O.
3. FURNITURE AND EQUIPENTS ARE SHOWN FOR REFERENCE ONLY. THEY ARE TO BE OWNER PROVIDED CONTRACTOR INSTALLED.
4. ALL DIMENSIONS TO BE FIELD VERIFIED

LEGEND | 1

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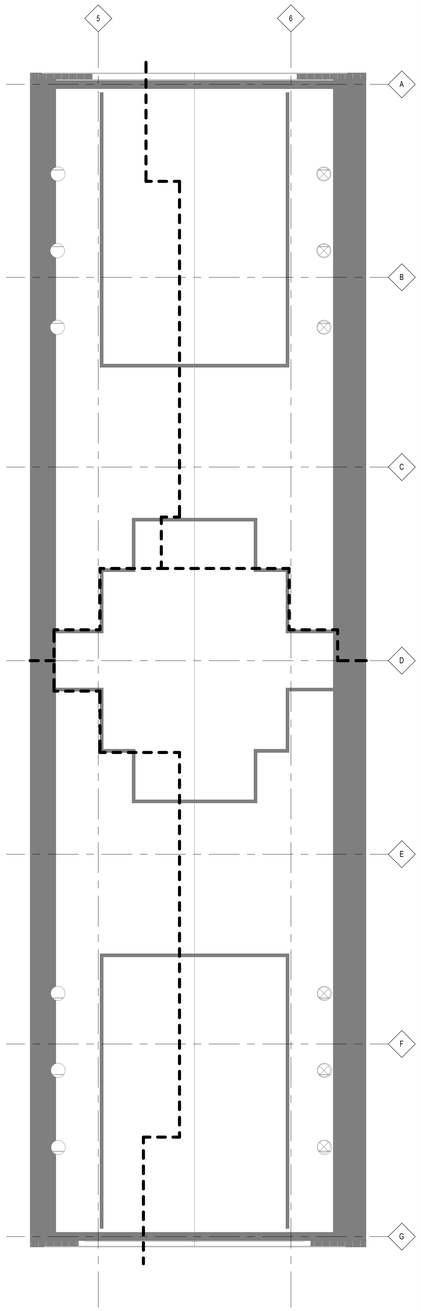
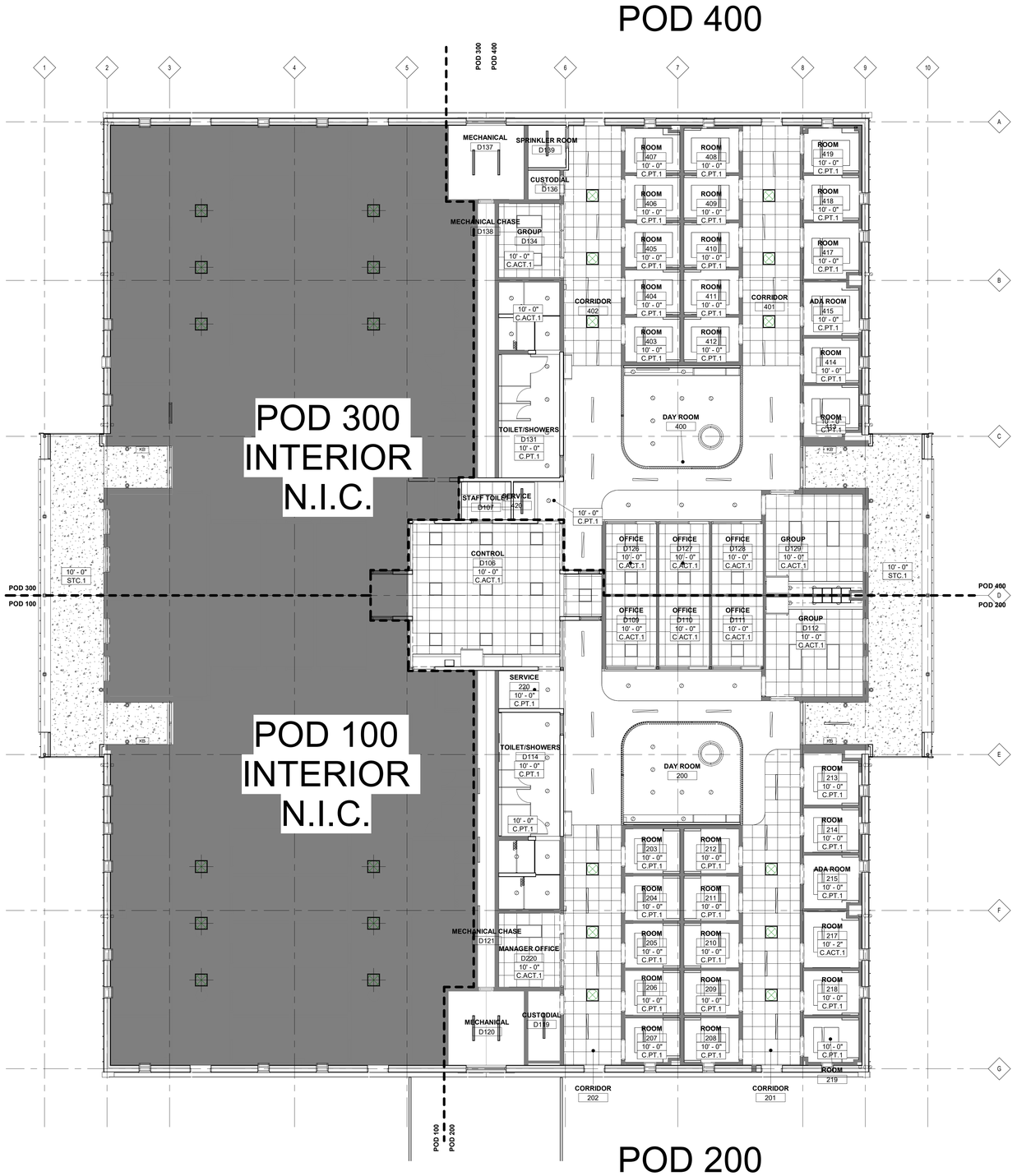
ENLARGED FLOOR PLAN - POD 400

Scale: AS NOTED

A.102





MECHANICAL MEZZANINE	1/8" = 1'-0"	17

OVERALL REFLECTED CEILING PLAN - PHASE I	1/8" = 1'-0"	5

LEGEND

GYPSUM BOARD CEILING; RE: FINISH SCHEDULE

2'X2' LAY-IN ACOUSTICAL TILE SUSPENDED CEILING SYSTEM; RE: FINISH SCHEDULE

TYPE A - 2X4 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE B - 2X2 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE C2 - RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE C4 - RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE D - RECESSED LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE E - READING LIGHT FIXTURE; SEE FLOOR PLAN FOR LOCATION. RE: ELECTRICAL

TYPE F - RECESSED LINEAR COVE LIGHT FIXTURE; RE: ELECTRICAL

TYPE G - TUBULAR DAYLIGHTING DEVICE FIXTURE; RE: ELECTRICAL

TYPE H - EXTERIOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE K - ACOUSTICAL PENDANT LIGHT FIXTURE; RE: ELECTRICAL

TYPE P - OUTDOOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE Q - OUTDOOR LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE R - OUTDOOR POLE LIGHT FIXTURE. SEE SITE PLAN FOR LOCATION; RE: ELECTRICAL

KEY NOTES	2

NOTES:

1. REFERENCE A.122 FOR TYPICAL NEW CONSTRUCTION NOTES, U.N.O.

GENERAL NOTES	1

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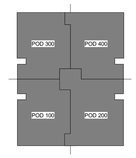
KEYPLAN:



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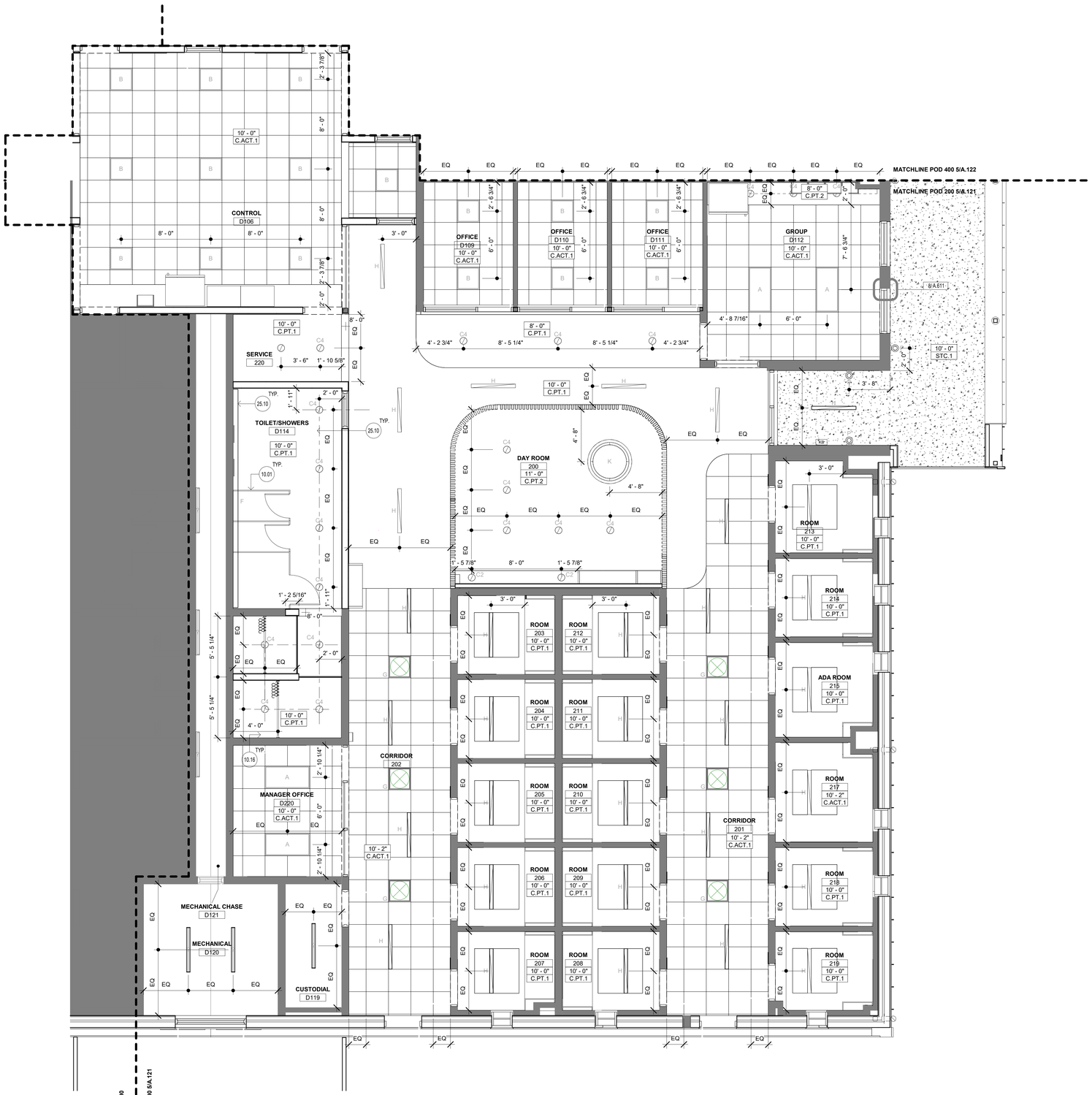
OVERALL REFLECTED CEILING PLAN

Scale: AS NOTED

A.120



ENLARGED REFLECTED CEILING PLAN - POD B | 1/4" = 1'-0" | 5

GYPSUM BOARD CEILING; RE: FINISH SCHEDULE

2'X2' LAY-IN ACOUSTICAL TILE SUSPENDED CEILING SYSTEM; RE: FINISH SCHEDULE

TYPE A -
2X4 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE B -
2X2 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE C2 -
RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE C4 -
RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE D -
RECESSED LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE E -
READING LIGHT FIXTURE; SEE FLOOR PLAN FOR LOCATION. RE: ELECTRICAL

TYPE F -
RECESSED LINEAR COVE LIGHT FIXTURE; RE: ELECTRICAL

TYPE G -
TUBULAR DAYLIGHTING DEVICE FIXTURE; RE: ELECTRICAL

TYPE H -
EXTERIOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE K -
ACOUSTICAL PENDANT LIGHT FIXTURE; RE: ELECTRICAL

TYPE P -
OUTDOOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE Q -
OUTDOOR LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE R -
OUTDOOR POLE LIGHT FIXTURE. SEE SITE PLAN FOR LOCATION; RE: ELECTRICAL

LEGEND | 2

10.01 Toilet partition(s) , re: Accessory schedule
10.16 Shower rod, curtain & hooks, re: Accessory schedule
25.10 Scheduled light fixture re: Electrical

ENLARGED PLAN NOTES:

1. POD - 200 AS SHOWN
2. POD - 400 IDENTICAL TO POD 200 UNO.

NOTES:

1. TYPICAL NEW CONSTRUCTION NOTES, U.N.O.

GENERAL NOTES & KEYNOTES | 1

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ENLARGED REFLECTED CEILING PLAN - POD 200

Scale: AS NOTED

A.121

ENLARGED REFLECTED CEILING PLAN - POD 400 | 1/4" = 1'-0" | 5

NORTH

GYPSUM BOARD CEILING; RE: FINISH SCHEDULE

2'X2' LAY-IN ACOUSTICAL TILE SUSPENDED CEILING SYSTEM; RE: FINISH SCHEDULE

TYPE A -
2X4 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE B -
2X2 FLUORESCENT LIGHT FIXTURE; RE: ELECTRICAL

TYPE C2 -
RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE C4 -
RECESSED CAN LIGHT FIXTURE; RE: ELECTRICAL

TYPE D -
RECESSED LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE E -
READING LIGHT FIXTURE; SEE FLOOR PLAN FOR LOCATION. RE: ELECTRICAL

TYPE F -
RECESSED LINEAR COVE LIGHT FIXTURE; RE: ELECTRICAL

TYPE G -
TUBULAR DAYLIGHTING DEVICE FIXTURE; RE: ELECTRICAL

TYPE H -
EXTERIOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE K -
ACOUSTICAL PENDANT LIGHT FIXTURE; RE: ELECTRICAL

TYPE P -
OUTDOOR WALL SCONCE LIGHT FIXTURE; RE: ELECTRICAL

TYPE Q -
OUTDOOR LINEAR LIGHT FIXTURE; RE: ELECTRICAL

TYPE R -
OUTDOOR POLE LIGHT FIXTURE. SEE SITE PLAN FOR LOCATION; RE: ELECTRICAL

LEGEND | 2

ENLARGED PLAN NOTES:

1. POD - 200 AS SHOWN
2. POD - 400 IDENTICAL TO POD 200 UNO.

NOTES:

1. TYPICAL NEW CONSTRUCTION NOTES, U.N.O.

GENERAL NOTES & KEYNOTES | 1

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ENLARGED REFLECTED CEILING PLAN - POD 400

Scale: AS NOTED

A.122

EXTERIOR FINISH SCHEDULE

FINISH MARK	ITEM	MANUFACTURER	MANUFACTURER NUMBER	MANUFACTURER NAME	FINISH	COMMENTS
MP.1	METAL PANEL	MORIN		VARIES	BONE WHITE	MORIN PANELS MATRIX-3, MATRIX-4, AND MATRIX-10 TO BE USED. SEE 4/A.301 FOR PATTERN
MP.2	METAL PANEL	MCELROY METAL		238-T	CHARCOAL	238T WALL SYSTEM TO BE APPLIED TO ROOF AND WALLS, 24" WIDE PANELS
MP.3	METAL PANEL	MCELROY METAL		VISIONLINE F-SERIES	SURREY BEIGE	
STC.1	STUCCO				SMOOTH	3 LAYER PORTLAND CEMENT PLASTER, PAINTED. COLOR TO BE SELECTED BY ARCHITECT
PT.1	KYNAR FINISH				SMOOTH	COLUMN COVER - COLOR TO BE SELECTED BY ARCHITECT
PT.2	PAINT	SHERWIN WILLIAMS				ACCENT PAINT
WD.1	IPE WOOD	US LUMBER BROKERS				1 X 6 IPE PLANKS, STAIN GRADE; GC TO PROVIDE 3 STAIN SAMPLES

FINISH SCHEDULE - EXTERIOR 8

FINISH SCHEDULE

FINISH MARK	ITEM	MANUFACTURER	MANUFACTURER NUMBER	MANUFACTURER NAME	FINISH	COMMENTS
FLOOR						
F.EP.1	EPOXY FLOOR					TOILET/SHOWER ROOMS
F.CONC.1	SEALED CONCRETE	-	-	-	-	ALL FLOORS TO BE F.CONC.1 U.N.O.
F.LVT.1	LUXURY VINYL TILE	TARKETT	0976	CONTOUR	WOVEN REED SILKSTRAW	CORRIDORS/GROUP ROOMS/CONTROLROOM
F.LVT.2	LUXURY VINYL TILE	TARKETT	C127	COLOR POP	BERMUDA	DAYROOM 200
F.LVT.3	LUXURY VINYL TILE	TARKETT	C177	COLOR POP	SUNBEAM	DAYROOM 400
F.SV.1	SHEET VINYL	TARKETT	0296	IQ GRANIT	WARM GREY	SLEEPING UNITS
BASE						
B.RB.1	RUBBER BASE	TARKETT	TSB25	JOHNSONITE	FAWN	
B.SV.1	SHEET VINYL	TARKETT	0296	IQ GRANIT	WARM GREY	SLEEPING UNITS
B.EP.1	EPOXY BASE					
WALL						
W.PT.1	PAINT 1	SHERWIN WILLIAMS	SW7757	HIGH REFLECTIVE WHITE	SEMI GLOSS	ALL WALLS TO BE W.PT.1 U.N.O.
W.PT.2	ACCENT PAINT	SHERWIN WILLIAMS	SW6759	COOLED BLUE	SEMI GLOSS	POD 200
W.PT.3	ACCENT PAINT	SHERWIN WILLIAMS	SW9019	GOLDEN PLUMERIA	SEMI GLOSS	POD 400
W.WD.1	WOOD SLAT WALL	SLAT SOLUTIONS		SLAT ROOM DIVIDER	MAPLE	
W.CT.1	CERAMIC TILE 10" X 30"	EMSER		VERTIGO	LINEAR	
W.SV.1	SHEET VINYL	TARKETT	0296	IQ GRANIT	WARM GREY	SLEEPING UNITS
CEILING						
C.ACT.1	2' X 2' MINERAL WOOL CEILING TILES	ROCKFON	SLN	ALASKA	WHITE	
C.PT.1	PAINT 1	SHERWIN WILLIAMS	SW7757	HIGH REFLECTIVE WHITE	SEMI GLOSS	ALL CEILINGS TO BE C.PT.1 U.N.O.
C.PT.2	ACCENT PAINT	SHERWIN WILLIAMS	SW6759	COOLED BLUE	SEMI GLOSS	POD 200
C.PT.3	ACCENT PAINT	SHERWIN WILLIAMS	SW9019	GOLDEN PLUMERIA	SEMI GLOSS	POD 400
MILLWORK						
M.PL.1	PLASTIC LAMINATE 1	WILSONART	7987-38	PALISADES OAK	FINE VELVET	
M.PL.2	MELAMINE	FORMICA	459-58	BRITE WHITE	MATTE FINISH	CABINET, SHELVING, AND DRAWER INTERIORS
M.QZ.1	QUARTZ	COSENTINO		SILESTONE	ET STATUARIO	ALL COUNTERTOPS
MISC.						
FT.1	FELT ACOUSTICAL PANEL	ACOUFELT	PE20	PEACOCK	SOLID, 12MM	POD 200
FT.2	FELT ACOUSTICAL PANEL	ACOUFELT	BU07	BUTTER	SOLID, 12MM	POD 400

FINISH SCHEDULE - INTERIOR 6

TOILET ACCESSORIES SCHEDULE

TAG	ITEM	MANUFACTURER	DESCRIPTION	MODEL	FINISH	COMMENTS
TA-1	TOILET PARTITIONS	BOBRICK	STANDARD PRIVACY - FLOOR TO CEILING			TOILET ENCLOSURES AND ENTRANCE SCREENS
TA-2	36" GRAB BAR	BOBRICK	1 1/2" DIAMETER GRAB BAR W/ SNAP FLANGE & PEENED GRIPPING SURFACE	B-6806.99 X 36	STAINLESS STEEL SATIN	
TA-3	42" GRAB BAR	BOBRICK	1 1/2" DIAMETER GRAB BAR W/ SNAP FLANGE & PEENED GRIPPING SURFACE	B-6806.99 X 42	STAINLESS STEEL SATIN	
TA-4	TOILET PAPER TISSUE DISPENSERS	TORK	DOUBLE-ROLL TOILET TISSUE DISPENSER	H-1347	SMOKE	
TA-5	SANITARY NAPKIN DISPOSAL	BOBRICK	CONTURA SERIES SANITARY NAPKIN DISPOSAL	B-270	STAINLESS STEEL SATIN	
TA-6	MIRROR	BOBRICK	FRAMED STAINLESS STEEL CHANNEL MIRROR	B-165	STAINLESS STEEL SATIN	
TA-7	HAND DRYER	EXCEL DRYER	XLERATOR HAND DRYER	XL-SB	BRUSHED STAINLESS STEEL	
TA-8	COAT HOOK	BOBRICK	ROBE HOOK (DOUBLE)	B-6727	STAINLESS STEEL SATIN	
TA-9	SOAP DISPENSER	ECOLAB	SURFACE MOUNTED SOAP DISPENSER	EL-92021192	BLACK	
TA-10	TRASH RECEPTACLE	BOBRICK	SURFACE MOUNTED WASTE RECEPTACLE	B-35649	STAINLESS STEEL SATIN	
TA-11	CURTAIN ROD	BOBRICK	CLASSIC SERIES EXTRA-HEAVY-DUITY SHOWER CURTAIN ROD	B-6107 X 36	BOBRICK SATIN	
TA-12	SHOWER SEAT	BOBRICK	REVERSIBLE FOLDING SHOWER SEAT	B-5181	STAINLESS STEEL	

TOILET ACCESSORY SCHEDULE 5

NOTES:

1. TYPICAL NEW CONSTRUCTION NOTES, U.N.O.
2. REFERENCE A.150 FOR SPECIFIC POD FINISHES.
   POD 200: F.LVT.2, W.PT.2, C.PT.2, AND FT.1
   POD 400: F.LVT.4, W.PT.4, C.PT.4, AND FT.3
3. GC TO REFERENCE A.730 FOR MOUNTING HEIGHTS

LEGEND 1

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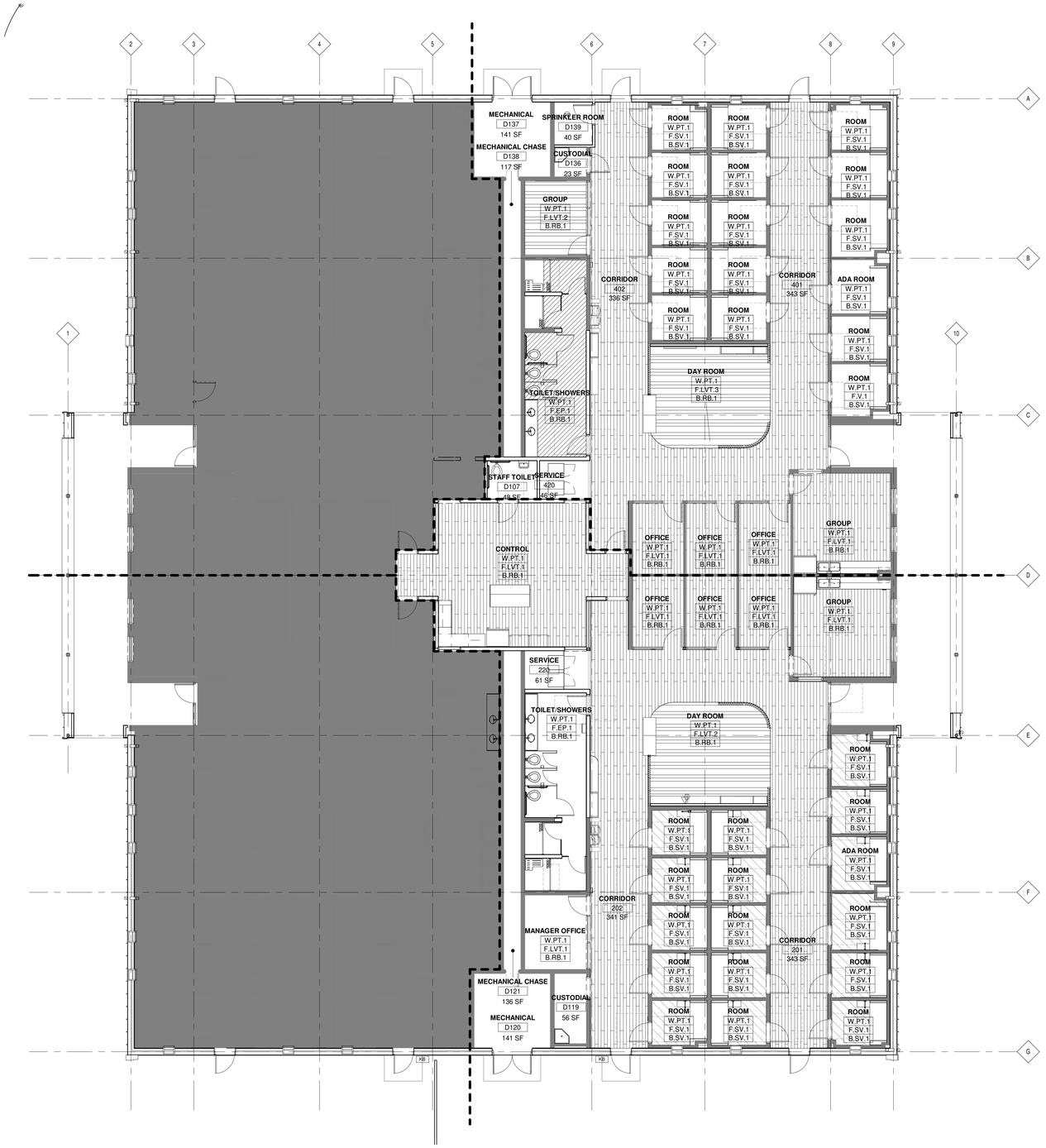
FINISH SCHEDULE

Scale: AS NOTED

A.150



OVERALL FINISH PLAN 1/8" = 1'-0" 5

KEYNOTES 2

F.CONC.1 - SEALED CONCRETE

F.SV.1 - SHEET VINYL

F.LVT.1 - LUXURY VINYL TILE

F.LVT.2 - LUXURY VINYL TILE
F.LVT.3 - LUXURY VINYL TILE
F.LVT.4 - LUXURY VINYL TILE
F.LVT.5 - LUXURY VINYL TILE

F.EP.1 - EPOXY FLOORING

NOTES:

1. TYPICAL NEW CONSTRUCTION NOTES, U.N.O.
2. REFERENCE A.150 FOR SPECIFIC POD FINISHES.
   POD 200: F.LVT.2, W.PT.2, C.PT.2, AND FT.1
   POD 400: F.LVT.4, W.PT.4, C.PT.4, AND FT.3

LEGEND 1

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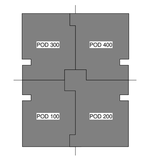

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OVERALL FINISH PLAN

Scale: AS NOTED

A.151

ENLARGED FINISH PLAN - POD B 1/4" = 1'-0" 5

KEYNOTES 2

F.CONC.1 - SEALED CONCRETE

F.SV.1 - SHEET VINYL

F.LVT.1 - LUXURY VINYL TILE

F.LVT.2 - LUXURY VINYL TILE
F.LVT.3 - LUXURY VINYL TILE
F.LVT.4 - LUXURY VINYL TILE
F.LVT.5 - LUXURY VINYL TILE

F.EP.1 - EPOXY FLOORING

NOTES:

1. TYPICAL NEW CONSTRUCTION NOTES, U.N.O.
2. REFERENCE A.150 FOR SPECIFIC POD FINISHES.
   POD 200: F.LVT.2, W.PT.2, C.PT.2, AND FT.1
   POD 400: F.LVT.4, W.PT.4, C.PT.4, AND FT.3

LEGEND 1

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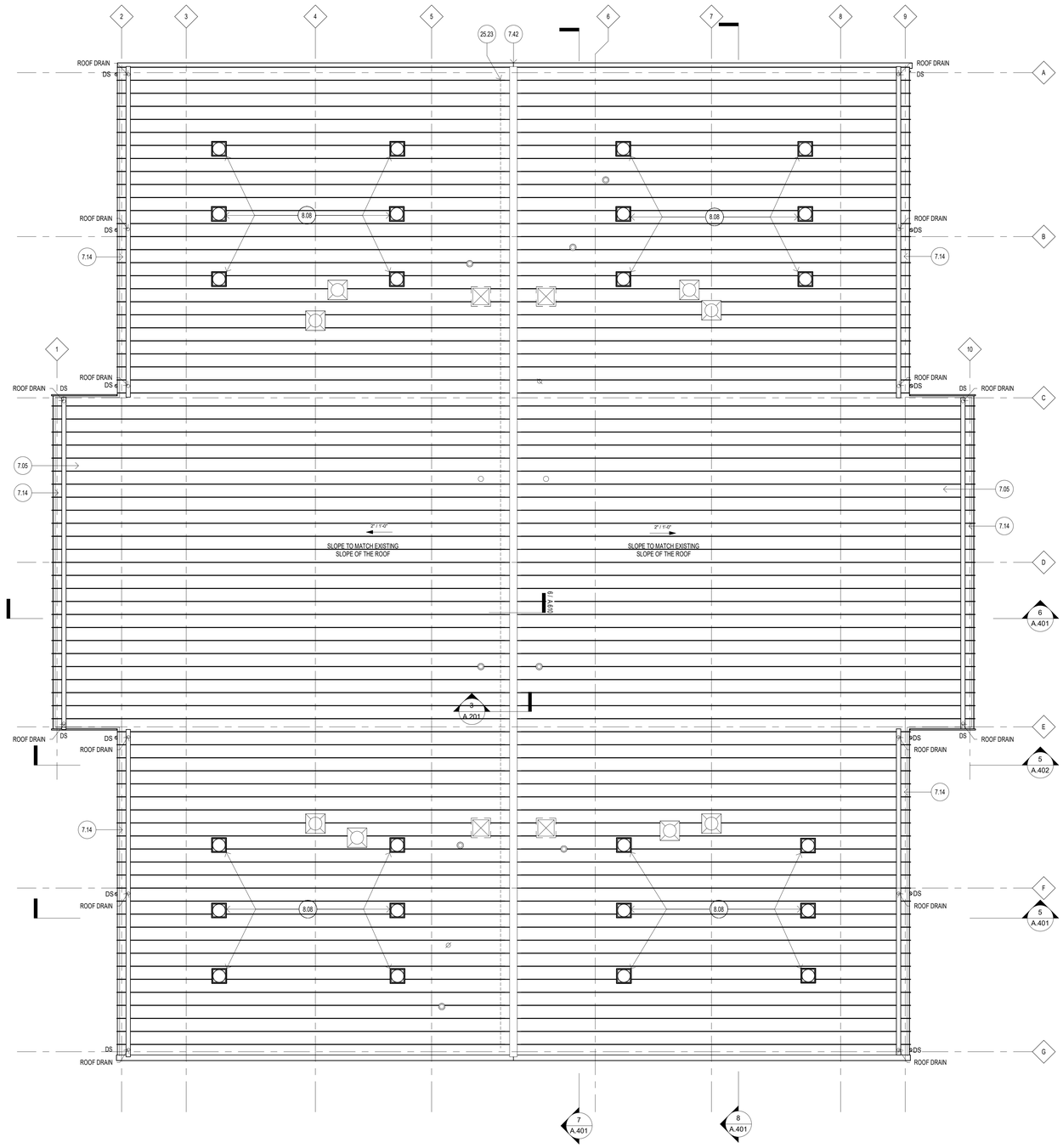
ENLARGED FINISH PLAN - POD 200

Scale: AS NOTED

A.152



ROOF PLAN 1/8" = 1'-0" 5

SOLAR TUBE	
CURBED GRAVITY VENT	
CURBED POWER VENT	
PIPE VENT	
GRAVITY VENT	
PLUMBING VENT	
CURBED GRAVITY VENT	
DOWNSPOUT	

ROOF LEGEND 1/8" = 1'-0" 4

7.05	Standing seam metal roof on polyisocyanurate insulation board
7.14	New concealed cast iron gutter and drain with membrane liner
7.42	Floating ridge cap
8.08	Tubular daylighting device, interior diffuser to be coordinated with ceiling finish
25.23	Conductor cable lightning protection system

KEYNOTES 2

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

NOTES:
1. ALL EXISTING PENETRATIONS ARE SHOWN FOR REFERENCE ONLY. GC TO VERITY EXACT LOCATION AND COORDINTE NEW PENETRATIONS AS PER NEW CONSTRUCTION DESIGN.

LEGEND 1

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ROOF PLAN

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A.200

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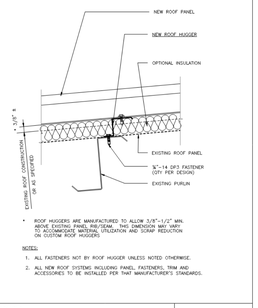

- ROOF HUGGERS ARE MANUFACTURED TO ALLOW 3/16"–1/2" MIN. ABOVE EXISTING PANEL RIB/SEAM. THIS DIMENSION MAY VARY ACCORDINGLY DEPENDING MATERIAL UTILIZATION AND SCRAP REDUCTION ON CUSTOM ROOF HUGGERS

NOTES:
1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE.
2. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.

GENERIC ROOF PANELS
HUGGER ATTACHMENT TO EXISTING PURLIN.
SCALE: 3"=1'-0"
HA-01-G
10/15/2013

ROOF HUGGER, INC
P.O. BOX 127, ODESSA FL 33556
P: 800 771-1711
F: 877 203-2254
www.roofhugger.com

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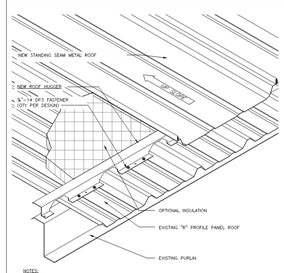

NOTES:
1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE
2. SEE ROOF HUGGER INSTALLATION INSTRUCTIONS FOR INFORMATION CONCERNING EXISTING FASTENERS BEING REMOVED OR LEFT IN PLACE.
3. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.

NEW TRAPEZOIDAL SSR OVER EXISTING "R" PROFILE ROOF PANELS
HUGGER ATTACHMENT TO EXISTING PURLIN.
SCALE: 1"=1'-0"
HA-03-T/R
10/15/2013

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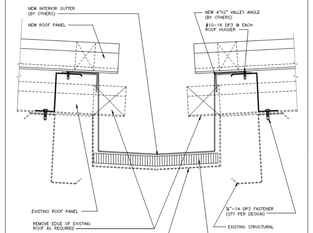

NOTES:
1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE.
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GENERIC ROOF PANELS
VALLEY GUTTER
SCALE: 1"=1'-0"
VG-01-G
5/1/2013

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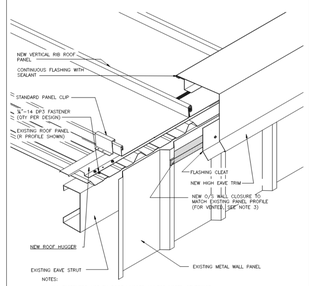
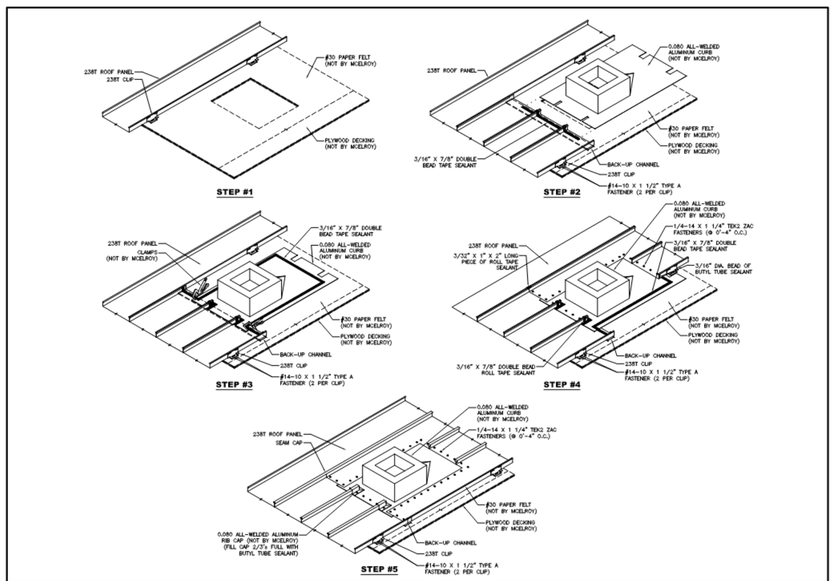


NOTES:
1. ALL FASTENERS NOT BY ROOF HUGGER UNLESS NOTED OTHERWISE.
2. ALL NEW ROOF SYSTEMS INCLUDING PANEL, FASTENERS, TRIM AND ACCESSORIES TO BE INSTALLED PER THAT MANUFACTURER'S STANDARDS.
3. FOR VENTED HIGH EAVE, USE "LP" VENTED CLOSURE AS MANUFACTURED BY MARCO INDUSTRIES – TULSA, OK OR OTHER AS PREFERRED.

NEW VERTICAL RIB SSR OVER EXISTING "R" PROFILE ROOF PANEL
HIGH EAVE
SCALE: 1"=1'-0"
HE-07-V/R
04/16/2014

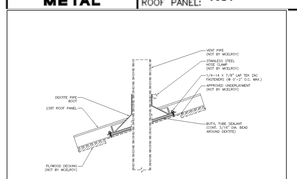


MCELROY METAL

ROOF CURB DETAILS

ISSUE/REVISION DATE: 06/24/2020

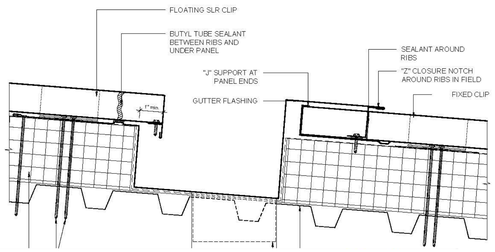
ROOF PANEL: 238T | SUBSTRATE: PLYWOOD | SCALE: N.T.S.



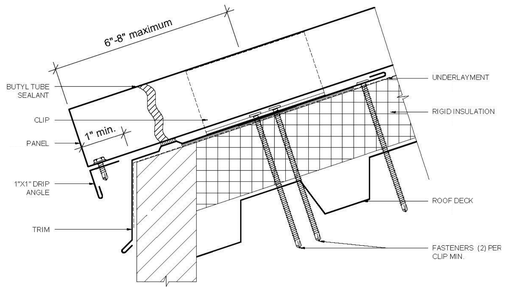
PIPE PENETRATION DETAIL
ISSUE/REVISION DATE: 06/24/2020
ROOF PANEL: 238T | SUBSTRATE: PLYWOOD | SCALE: N.T.S.

NOTE: MANUFACTURER RECOMMENDED DETAIL ARE INCLUDED TO ESTABLISH BASIS OF DESIGN AND REFERENCE ONLY.

MANUFACTURER RECOMMENDED ROOF DETAIL FOR REFERENCE | 3

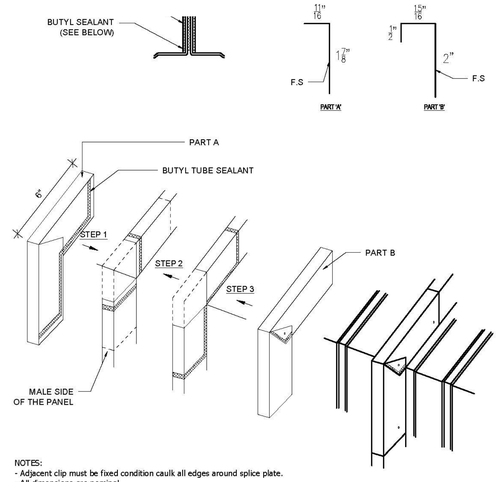


R.MP.2 - INTERNAL GUTTER | 3" = 1'-0" | 7



BASE OF MP-2 WALL DETAIL TO BE SIM TO STANDING-SEAM TYPICAL EAVE TRIM AS SHOWN

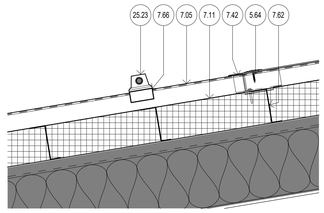
R.MP.2 - WALL BASE TRIM | 3" = 1'-0" | 6



NOTES:
- Adjacent clip must be fixed condition caulk all edges around splice plate.
- All dimensions are nominal.
- Fabricate trim to fit inside and outside of panel seam as req'd.

R.MP.2 - KNEE CONSTRUCTION | 3" = 1'-0" | 5

LIGHTNING PROTECTION DETAIL | 1 1/2" = 1'-0" | 3



5.64	Standing seam metal clip
7.05	Standing seam metal roof on polyisocyanurate insulation board
7.11	Rigid board insulation, re: Specifications
7.42	Floating ridge cap
7.62	Roof hugger subframe
7.66	Standing seam clamp
25.23	Conductor cable lightning protection system

KEYNOTES | 2

NOTES:
1. ALL EXISTING PENETRATIONS ARE SHOWN FOR REFERENCE ONLY. GC TO VERITY EXACT LOCATION AND COORDINTE NEW PENETRATIONS AS PER DESIGN.
2. REFER TO PLAN DETAILS AND SECTION DETAILS FOR MORE INFORMATION.

LEGEND | 1

JC DIVERSION CENTER RENOVATION

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FERNANDO L. BRAVE
14293
STATE OF TEXAS

09/23/2024

FILE:
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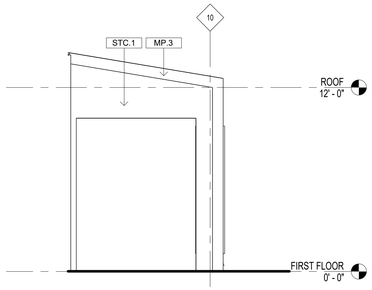
CHECKED BY: MM

ISSUE:
09/23/2024 100% CONSTRUCTION DOCUMENTS

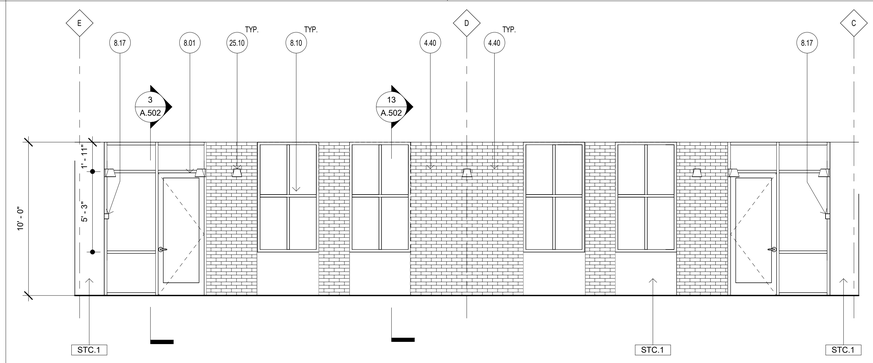
ROOF DETAILS

Scale: AS NOTED

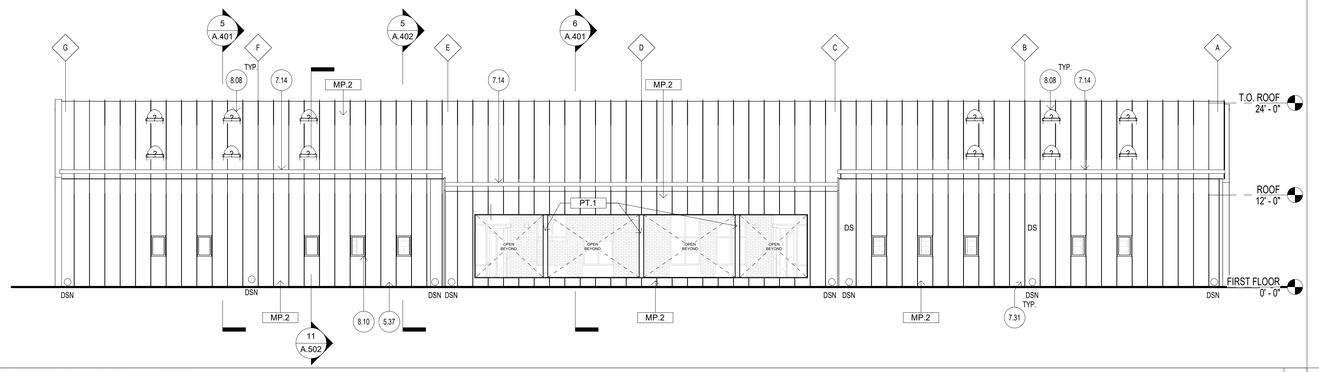
A.201



EAST ENTRY SIDE ELEVATION 1/4" = 1'-0" | 15



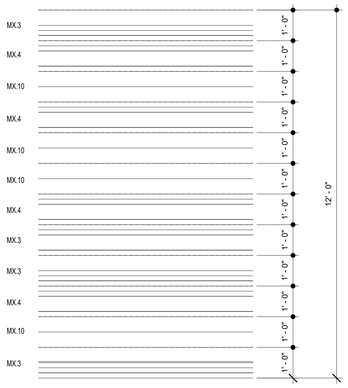
EAST ENTRY ELEVATION (WEST SIM) 1/4" = 1'-0" | 7



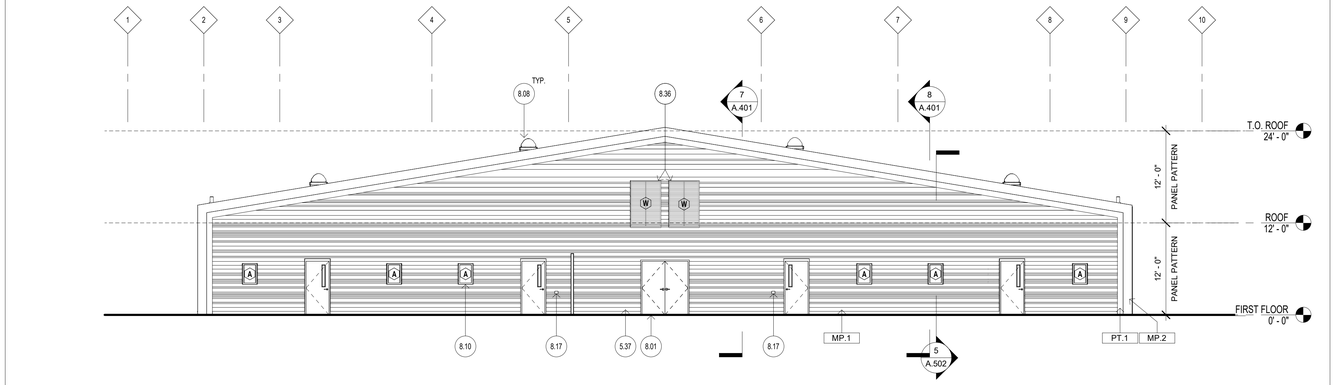
EAST ELEVATION (WEST SIM) 1/8" = 1'-0" | 6

4.40	Existing brick facade to be power washed; existing mortar to be repointed, color to be verified by architect
5.37	New metal panel on existing structure; re: Finish Schedule
7.14	New concealed cast iron gutter and drain with membrane liner
7.31	Metal downspout boot to connect to underground storm system, finish to match downspout
8.01	Scheduled door; Re: Door schedule
8.08	Tubular daylighting device, interior diffuser to be coordinated with ceiling finish
8.10	Scheduled window, re: Window schedule
8.17	Knox box, re: Specifications
8.36	Existing louver to remain
25.10	Scheduled light fixture re: Electrical

KEYNOTES 2



TYP. METAL PANEL PATTERN 1/2" = 1'-0" | 17



SOUTH ELEVATION (NORTH SIM) 1/8" = 1'-0" | 5

GENERAL NOTES 1

JC DIVERSION CENTER RENOVATION

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09/23/2024

FILE:
DRAWN BY: EH
CHECKED BY: MM

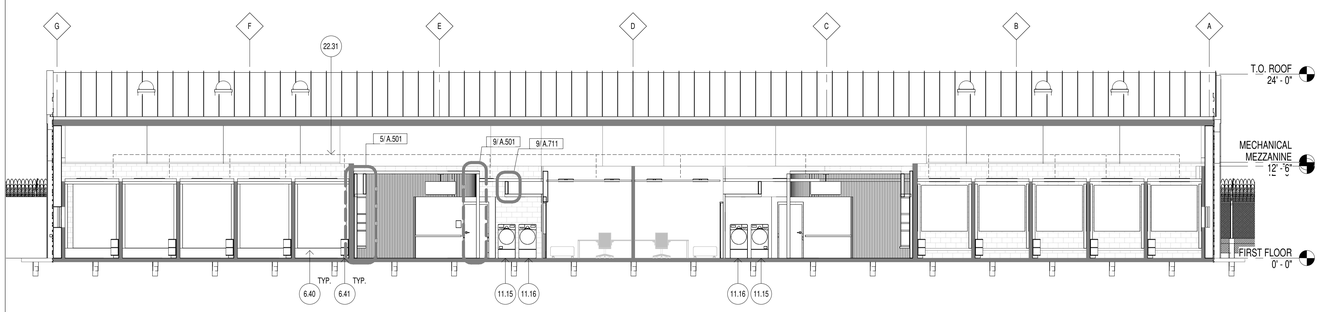
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

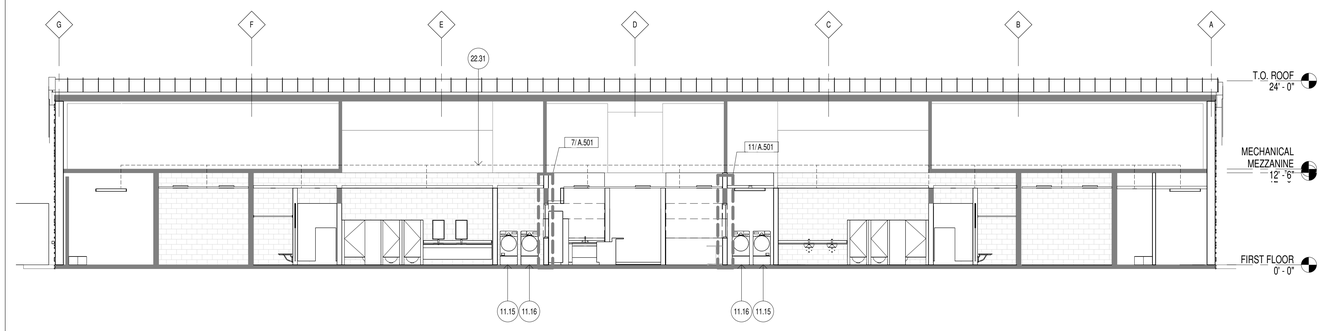
EXTERIOR ELEVATIONS

Scale: AS NOTED

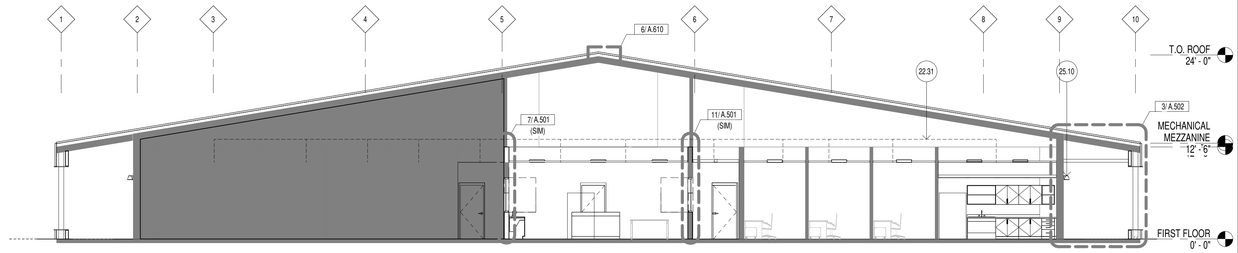
A.300



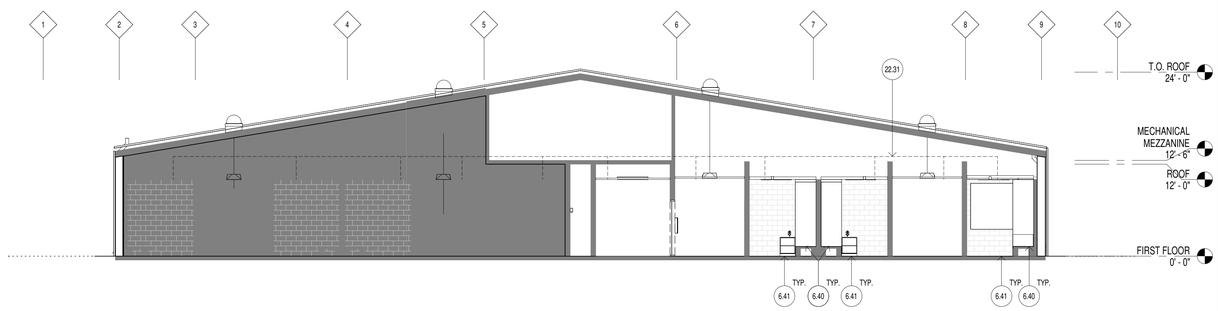
SECTION THROUGH DAYROOM 1/8" = 1'-0" | 8



SECTION THROUGH CONTROL ROOM 1/8" = 1'-0" | 7



SECTION THROUGH OFFICES 1/8" = 1'-0" | 6



SECTION THROUGH UNITS 1/8" = 1'-0" | 5

KEYNOTES | 2

6.40	Platform millwork, re: Millwork details
6.41	Open shelving millwork; re: Millwork details
11.15	Washer-Owner Provided Contractor Installed
11.16	Dryer - Owner Provided Contractor Installed
22.31	Fire sprinkler system; RE: Plumbing for general notes
25.10	Scheduled light fixture re: Electrical

LEGEND | 1

NOTES:

THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

JC DIVERSION CENTER RENOVATION

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FERNANDO L. BRAVE
14293
STATE OF TEXAS

09/23/2024

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ISSUE:

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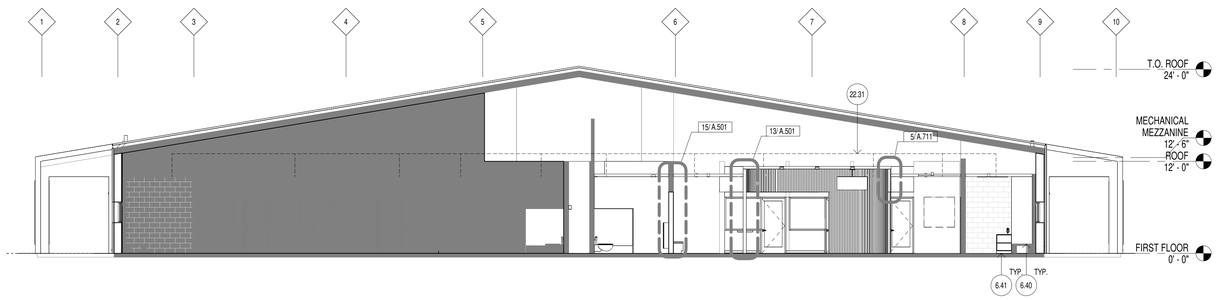
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

BUILDING SECTIONS

Scale: AS NOTED

A.401

		6.40 Platform millwork, re: Millwork details 6.41 Open shelving millwork; re: Millwork details 22.31 Fire sprinkler system; RE: Plumbing for general notes
		KEYNOTES 2
		NOTES: THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3 ROOFS: ABOVE DECK: R-25ci METAL BUILDINGS: R-19 + R-11 LS WALLS, ABOVE GRADE: METAL BUILDING: R13 + R-6.5ci METAL FRAMED: R-13 + R-5ci
	SECTION THROUGH RESTROOM 1/8" = 1'-0" 5	LEGEND 1

JC DIVERSION CENTER RENOVATION

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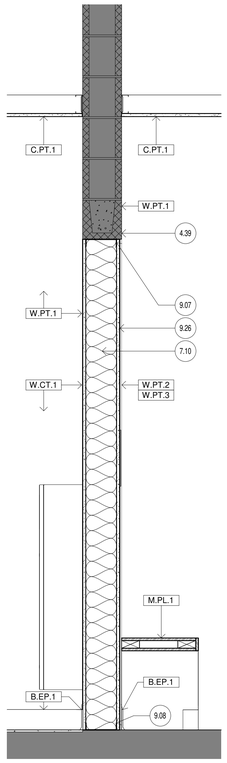
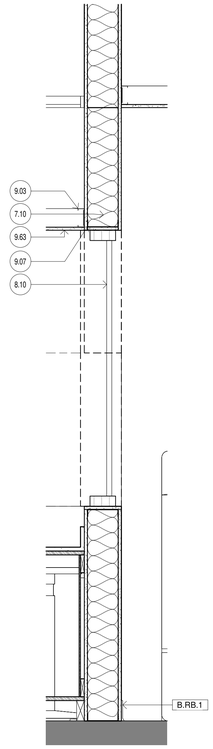
BUILDING SECTIONS

Scale: AS NOTED

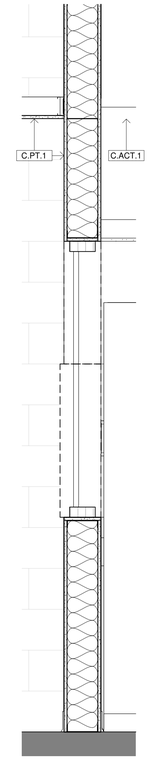
A.402



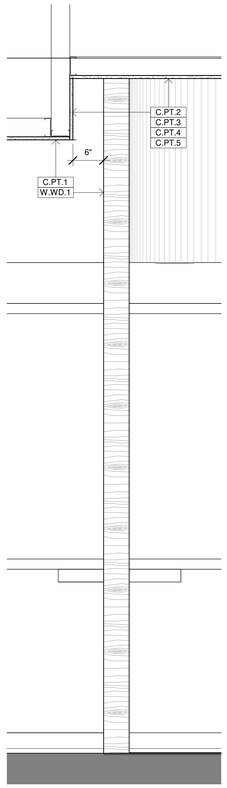
WALL SECTION - CMU INFILL 1" = 1'-0" 15



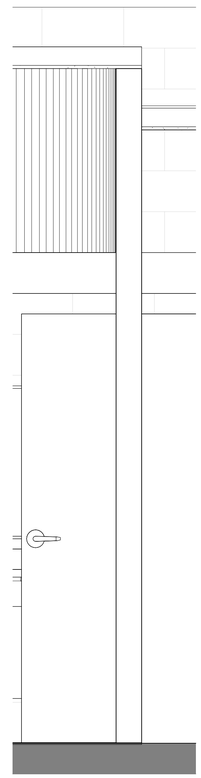
WALL SECTION @ NEW GLAZING/COUNTER 1" = 1'-0" 11



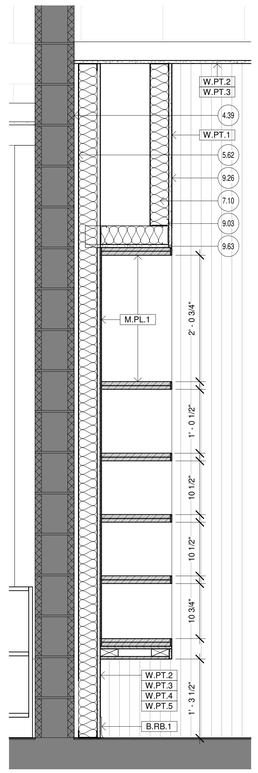
WALL SECTION @ NEW GLAZING 1" = 1'-0" 7



WALL SECTION - SLATS @ COUNTER 1" = 1'-0" 13



WALL SECTION @ SLATS 1" = 1'-0" 9



WALL SECTION @ MILLWORK 1" = 1'-0" 5

4.39	Existing 8" thick running bond CMU; re: Finish Schedule
5.62	7/8" Hat channel
7.10	Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
8.10	Scheduled window, re: Window schedule
9.03	3-5/8" metal studs at 16" O.C. Maximum
9.07	Top runner
9.08	Bottom runner
9.26	5/8" gypsum board
9.63	Gypsum board furrdown

KEYNOTES 1

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

LEGEND 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

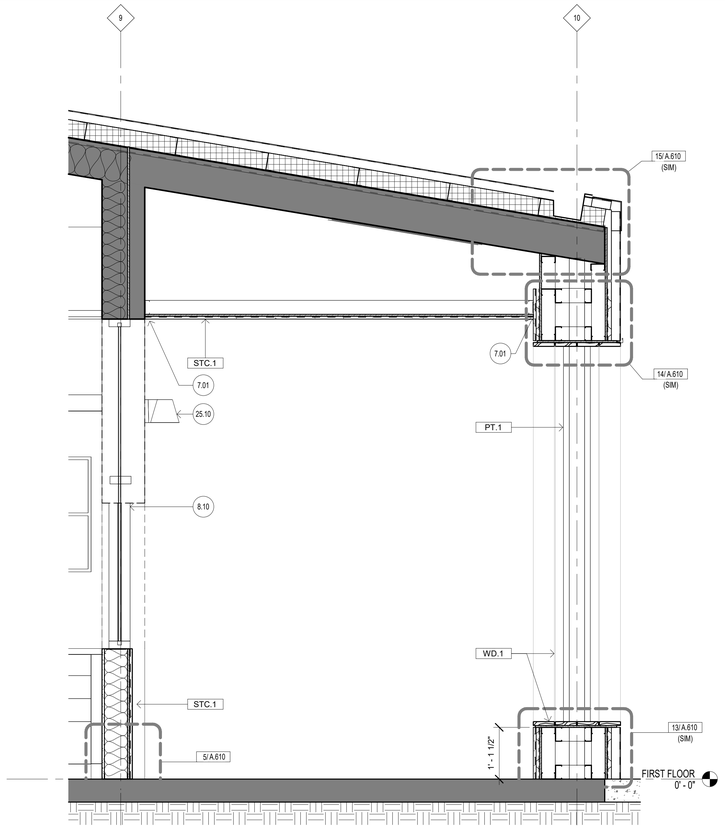
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

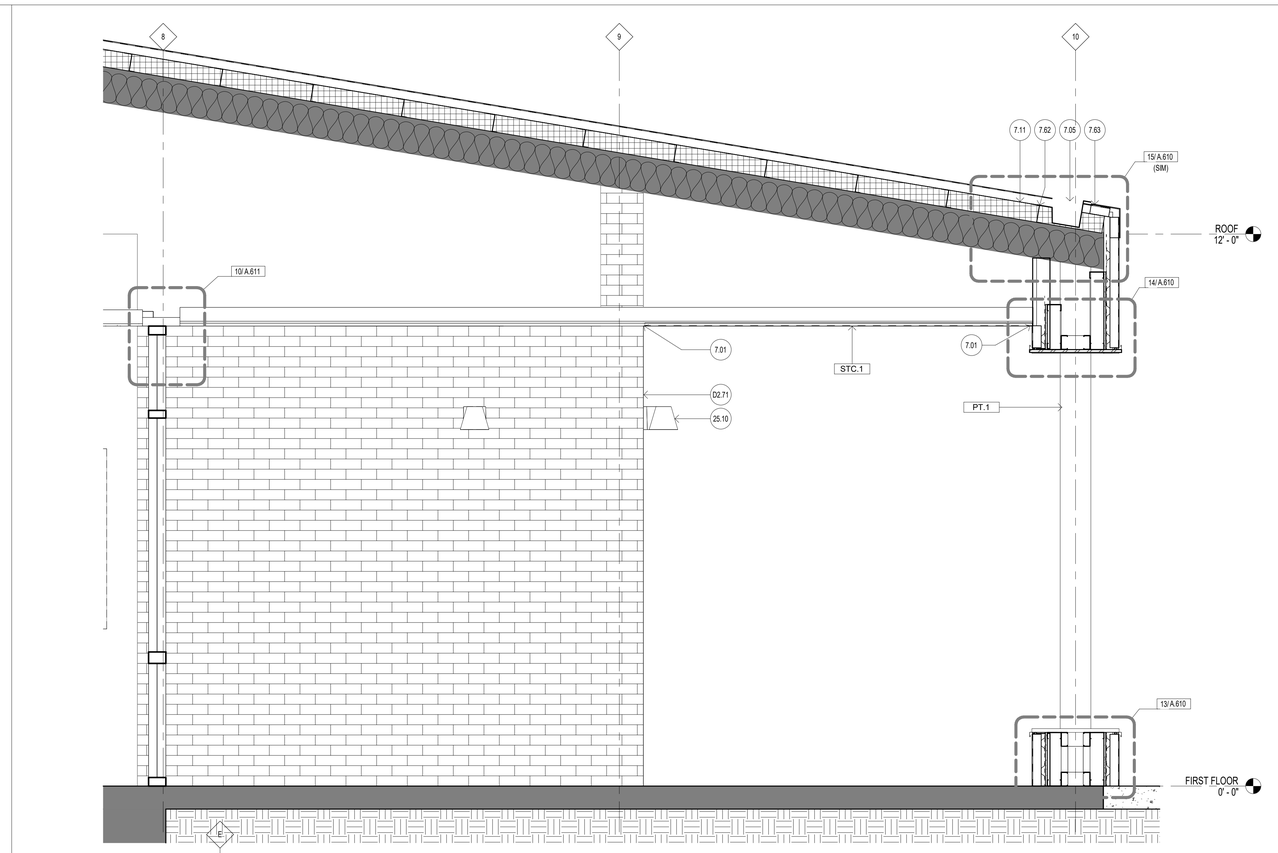
INTERIOR WALL SECTIONS

Scale: AS NOTED

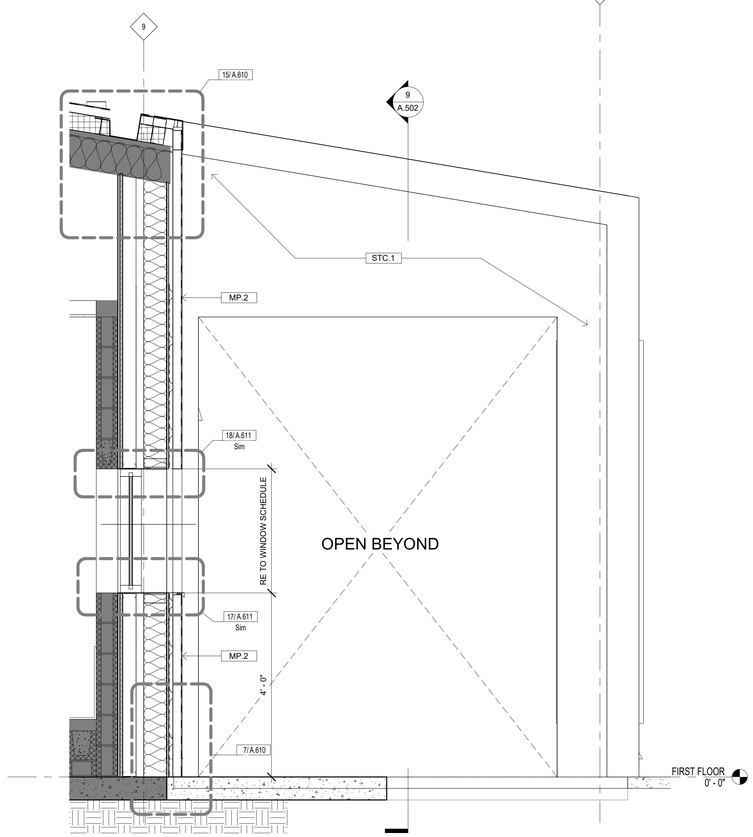
A.501



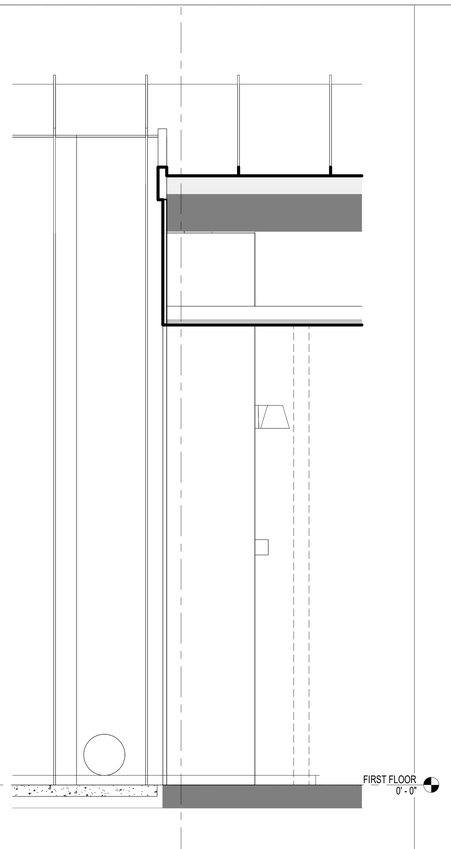
WALL SECTION TYP - ENTRY CANOPY 10 3/4" = 1'-0" | 13



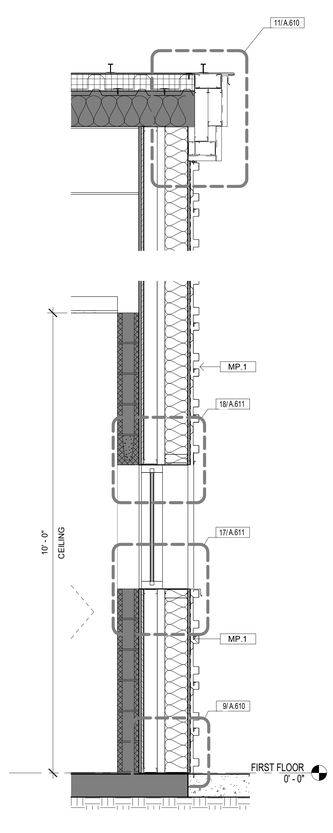
WALL SECTION TYP - ENTRY PORCH 3/4" = 1'-0" | 3



WALL SECTION TYP EAST-WEST 3/4" = 1'-0" | 11



WALL SECTION THRU ENTRY CANOPY 3/4" = 1'-0" | 9



WALL SECTION TYP NORTH-SOUTH 3/4" = 1'-0" | 5

7.01	Provide soffit vent with required trim accessory	
7.05	Standing seam metal roof on polyisocyanurate insulation board	
7.11	Rigid board insulation, re: Specifications	
7.62	Roof hugger subframe	
7.63	Standing seam knee/rib cover	
8.10	Scheduled window, re: Window schedule	
25.10	Scheduled light fixture re: Electrical	
D2.71	Existing wall to remain	

KEYNOTES 2

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

LEGEND 1

JC DIVERSION CENTER RENOVATION

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FERNANDO L. BRAVE
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09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

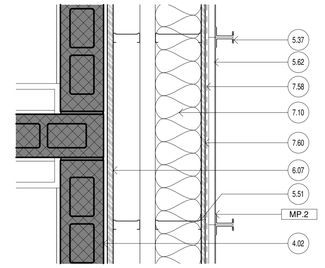
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

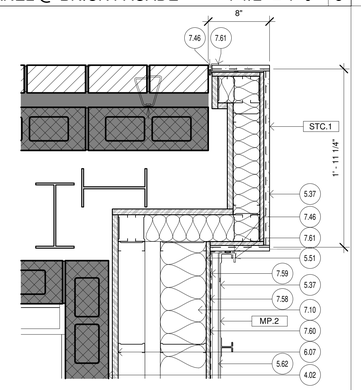
EXTERIOR WALL SECTIONS

Scale: AS NOTED

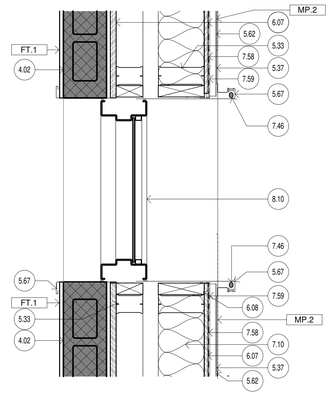
A.502



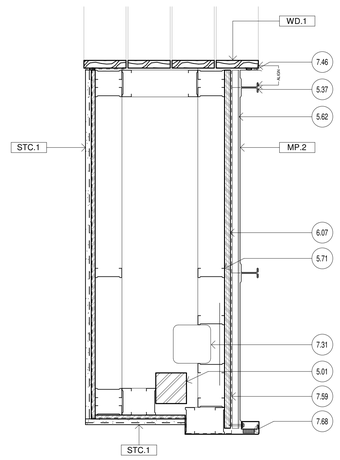
METAL PANEL @ BRICK FACADE 1 1/2" = 1'-0" | 8



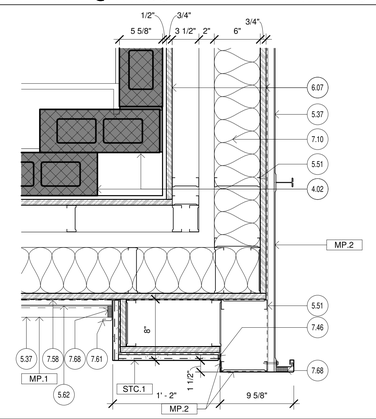
METAL PANEL @ BRICK CORNER 1 1/2" = 1'-0" | 7



METAL PANEL @ WINDOW 1 1/2" = 1'-0" | 6



COLUMN COVER @ FRONT CANOPY 1 1/2" = 1'-0" | 9



EXTERIOR CORNER DETAIL 1 1/2" = 1'-0" | 5

KEYNOTES | 2

4.02	6" thick standard CMU, re: Finish schedule
5.01	Steel column; re: Structural
5.33	Double studs at all exterior door and window jambs, full height
5.37	New metal panel on existing structure; re: Finish Schedule
5.51	6" galvanized CFMF; re: Structural
5.62	7/8" Hat channel
5.67	Prefinished break metal to match adjacent hollow metal frame
5.71	3 1/2" metal stud
6.07	Plywood sheathing
6.08	Treated wood blocking as required
7.10	Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
7.31	Metal downspout boot to connect to underground storm system, finish to match downspout
7.46	Backer rod and sealant
7.58	Fluid applied air and water barrier
7.59	Self-adhered air and water barrier
7.60	1/2" Gypsum sheathing
7.61	J-trim
7.68	Outside foam closure
8.10	Scheduled window, re: Window schedule

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

LEGEND | 1

JC DIVERSION CENTER RENOVATION

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B/A Project No.: 23141

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REGISTERED ARCHITECT
FERMIN DEL BRAVE
14293
STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: EH
CHECKED BY: MM

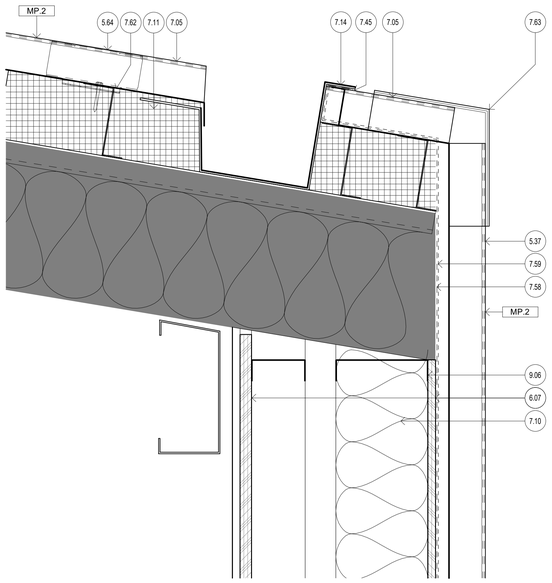
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

PLAN DETAILS

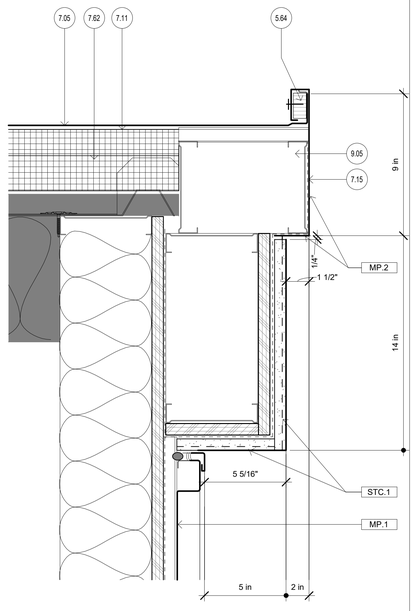
Scale: AS NOTED

A.601

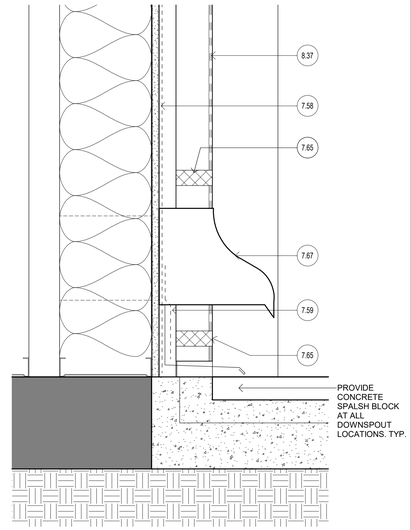


NOTE: PROVIDE HOOK STRIP OR CLEAT FOR PANEL MOVEMENT. PROVIDE STAINLESS STEEL GUTTER LINED AND LIQUID APPLIED REINFORCED PMMA WATER PROOFING MEMBRANE AT ALL GUTTERS. TYP.

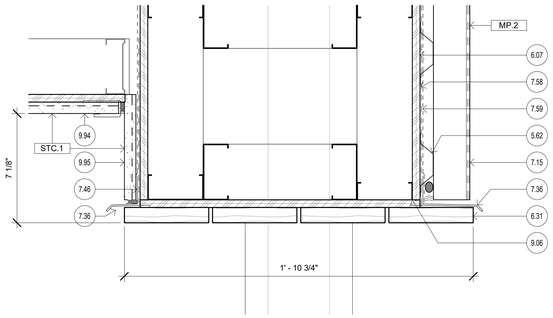
GUTTER DETAIL TYP. 3" = 1'-0" 15



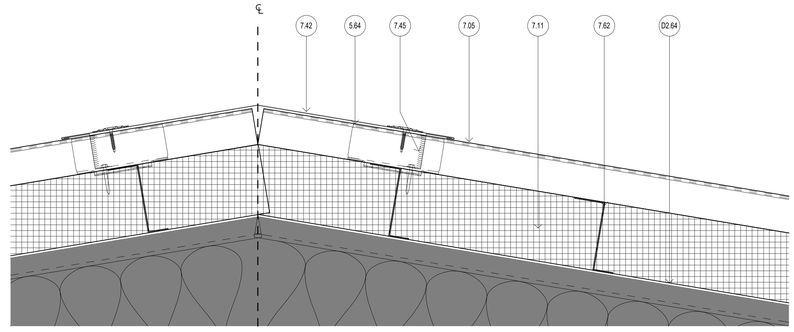
METAL PANEL FASCIA TYP. 3" = 1'-0" 11



DETAIL @ DOWNSPOUT 3" = 1'-0" 7



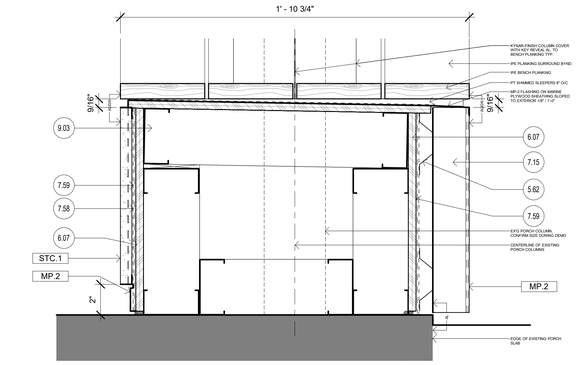
ENTRY CANOPY OPENING - HEADER 3" = 1'-0" 14



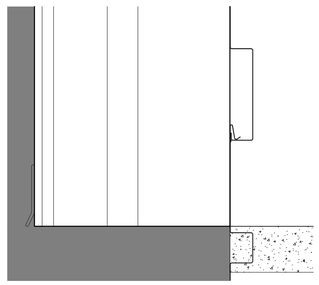
FIXED RIDGE ROOF DETAIL 3" = 1'-0" 6

5.37	New metal panel on existing structure; re: Finish Schedule
5.62	7/8" Hat channel
5.64	Standing seam metal clip
6.07	Plywood sheathing
6.31	Wood bench, stained
7.05	Standing seam metal roof on polyisocyanurate insulation board
7.10	Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
7.11	Rigid board insulation, re: Specifications
7.14	New concealed cast iron gutter and drain with membrane liner
7.15	Metal wall panel, re: Finish Schedule
7.36	Metal trim flashing
7.42	Floating ridge cap
7.45	Sealant
7.46	Backer rod and sealant
7.58	Fluid applied air and water barrier
7.59	Self-adhered air and water barrier
7.62	Roof hugger subframe
7.63	Standing seam knee/rib cover
7.65	Debris/insect guard
7.67	Bird screen for nickel- bronze downspout nozzle
8.37	Scheduled wall assembly; re: Elevations
9.03	3-5/8" metal studs at 16" O.C. Maximum
9.05	6" metal studs at 16" O.C. Maximum
9.06	6" exterior wall metal studs at 16" O.C. Maximum
9.94	Scheduled stucco soffit; re: Finish schedule
9.95	Scheduled stucco wall; re: Finish schedule
D2.64	Roof to remain

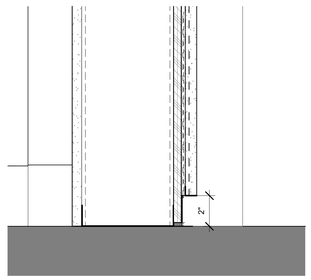
KEYNOTES 2



ENTRY CANOPY OPENING - BENCH 3" = 1'-0" 13



METAL PANEL BASE AT EX'G SLAB EDGE 3" = 1'-0" 9



STUCCO BASE AT EX'G CONCRETE 3" = 1'-0" 5

ROOF NOTES

1. PROVIDE HOOK STRIP OR CLEAT FOR PANEL MOVEMENT AS NECESSARY.

2. PROVIDE STAINLESS STEEL GUTTER LINER AND A LIQUID APPLIED REINFORCED PMMA WATER PROOFING MEMBRANE INSIDE THE GUTTERS TO PREVENT LEAKS IN FUTURE.

NOTES:

THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

LEGEND 1

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DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

06/14/2024	DESIGN DEVELOPMENT
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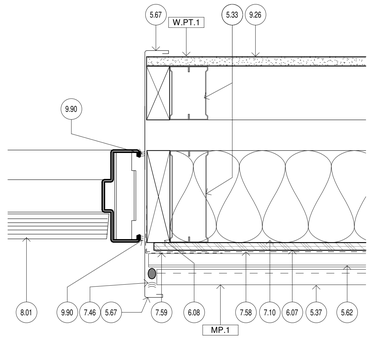
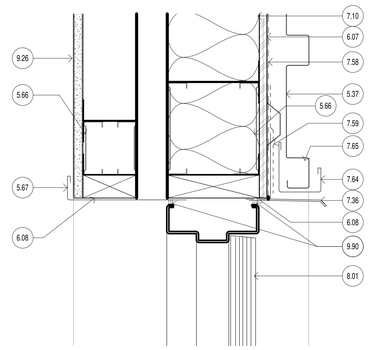
SECTION DETAILS

Scale: AS NOTED

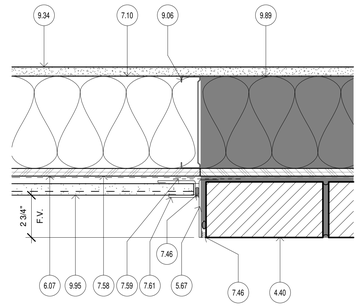
A.610



JAMB @ HM DOOR 3" = 1'-0" 16

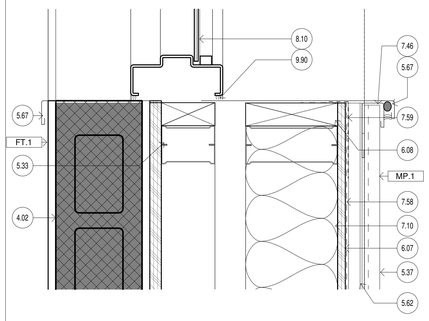


HEADER @ HM DOOR 3" = 1'-0" 12

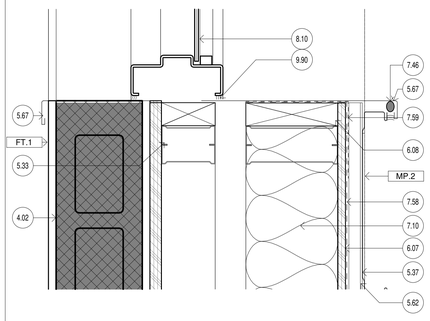


DETAIL @ STUCCO/BRICK 3" = 1'-0" 8

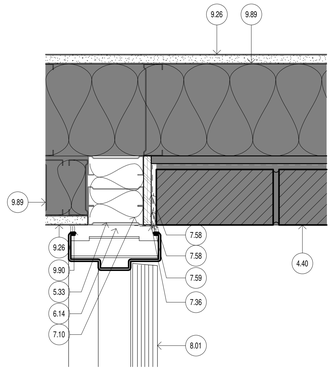
4



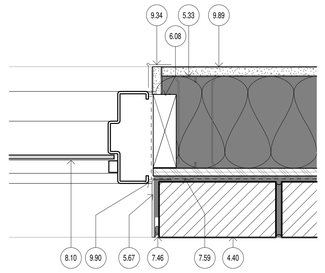
HM JAMB @ VERTICAL PANEL 3" = 1'-0" 19



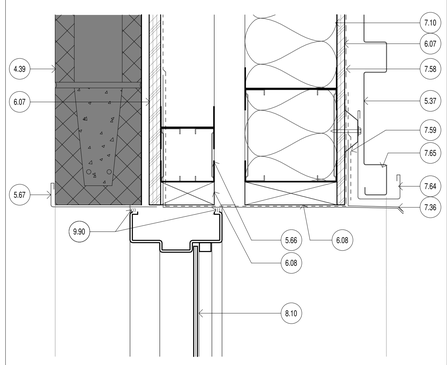
HM JAMB @ HORIZONTAL PANEL 3" = 1'-0" 15



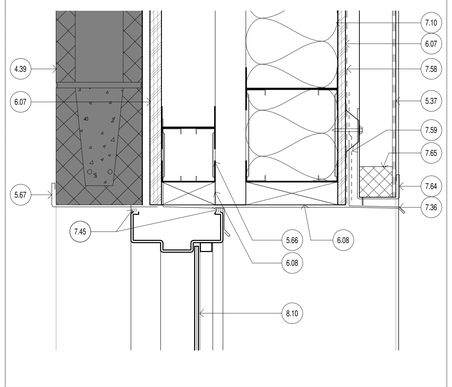
STOREFRONT JAMB @ ENTRY 3" = 1'-0" 11



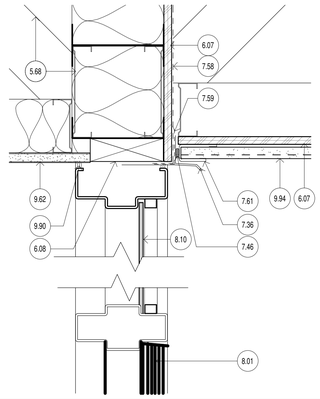
HM JAMB @ VERTICAL METAL 3" = 1'-0" 7



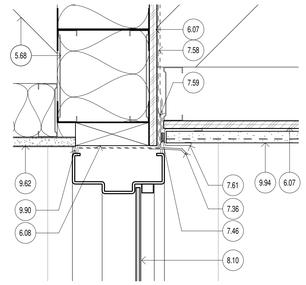
HM HEADER @ HORIZONTAL METAL 3" = 1'-0" 18



HM HEADER @ VERTICAL METAL 3" = 1'-0" 14



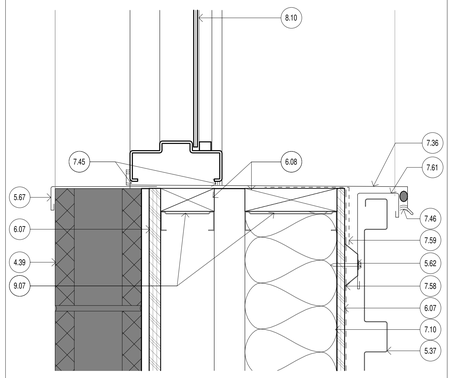
HEADER @ STOREFRONT ENTRY 3" = 1'-0" 10



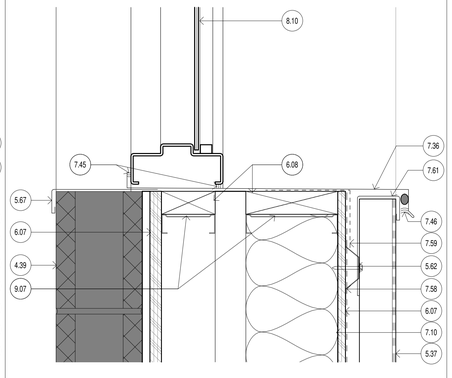
BRICK WINDOW HEADER 3" = 1'-0" 6

3.18	Existing slab; Field verify	
4.02	6" thick standard CMU, re: Finish schedule	
4.39	Existing 8" thick running bond CMU; re: Finish Schedule	
4.40	Existing brick facade to be power washed; existing mortar to be repointed, color to be verified by architect	
5.33	Double studs at all exterior door and window jambs, full height	
5.37	New metal panel on existing structure; re: Finish Schedule	
5.62	7/8" Hat channel	
5.66	Box header at all opening over 4'- 0" wide, combined with deflection track where needed	
5.67	Prefinished break metal to match adjacent hollow metal frame	
5.68	Secure with structure to existing; field verify	
6.07	Plywood sheathing	
6.08	Treated wood blocking as required	
6.14	Shim as required	
7.10	Batt insulation: depth of insulation to match depth of wall stud, unless noted otherwise	
7.36	Metal trim flashing	
7.45	Sealant	
7.46	Backer rod and sealant	
7.58	Fluid applied air and water barrier	
7.59	Self-adhered air and water barrier	
7.61	J-trim	
7.64	J-trim with weeps	
7.65	Debris/insect guard	
8.01	Scheduled door; Re: Door schedule	
8.10	Scheduled window, re: Window schedule	
9.06	6" exterior wall metal studs at 16" O.C. Maximum	
9.07	Top runner	
9.26	5/8" gypsum board	
9.34	Corner bead	
9.62	Gypsum board ceiling	
9.89	Existing wall; Field verify	
9.90	Caulk both sides	
9.94	Scheduled stucco soffit; re: Finish schedule	
9.95	Scheduled stucco wall; re: Finish schedule	
9.96	Scheduled flooring; re: Finish schedule	

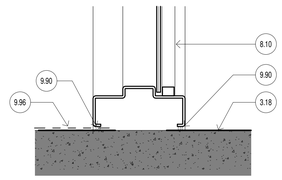
KEYNOTES 2



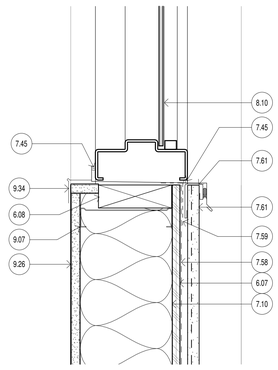
HM SILL @ HORIZONTAL METAL 3" = 1'-0" 17



HM SILL @ VERTICAL METAL 3" = 1'-0" 13



HM SILL 3" = 1'-0" 9



BRICK WINDOW SILL 3" = 1'-0" 5

NOTES:
THE FOLLOWING INSULATION VALUES TO BE USED PER IBC TABLE C402.1.3

ROOFS:
ABOVE DECK: R-25ci
METAL BUILDINGS: R-19 + R-11 LS

WALLS, ABOVE GRADE:

METAL BUILDING: R13 + R-6.5ci
METAL FRAMED: R-13 + R-5ci

LEGEND 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE / architecture

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713.524.5858 v / 713.524.5868 f

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DALLY + ASSOCIATES
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HOUSTON, TEXAS 77042
Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
Landscape Contact

STRUCTURAL
DALLY + ASSOCIATES
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HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

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SEAL:

REGISTERED ARCHITECT
FERNANDO L. BRAVE
14292
STATE OF TEXAS

09/23/2024

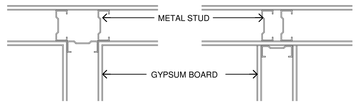
FILE:
DRAWN BY: DK
CHECKED BY: MM

ISSUE:
09/23/2024 100% CONSTRUCTION DOCUMENTS

EXTERIOR GLAZING & DOOR DETAILS

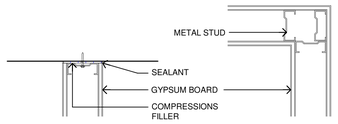
Scale: AS NOTED

A.611



PARTITION TEE

PARTITION TEE @
CORRIDOR OR RATED WALL

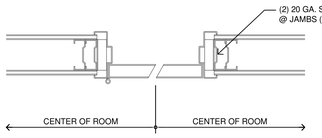


PARTITION TEE @
ADJOINING WALL

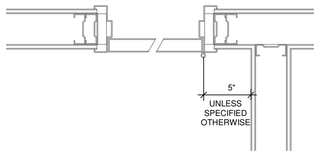
TYPICAL CORNER
CONDITION

NOTE:
REFER TO PLANS FOR PARTITION TYPE.
REFER TO PARTITION TYPES FOR SIZE AND CONSTRUCTION

TYPICAL PARTITION CONNECTIONS N.T.S. 18



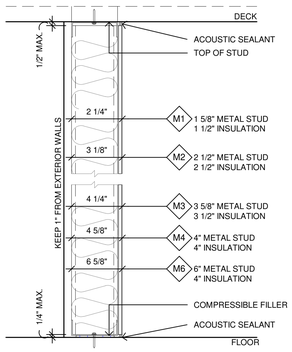
TYPICAL OPENING @ MIDDLE OF ROOM



TYPICAL OPENING @ CORNER OF ROOM

NOTE:
REFER TO DOOR SCHEDULE FOR DOOR SIZE
REFER TO PLANS FOR PARTITION TYPE.
REFER TO PARTITION TYPES FOR SIZE AND CONSTRUCTION

TYPICAL PARTITION OPENINGS N.T.S. 17

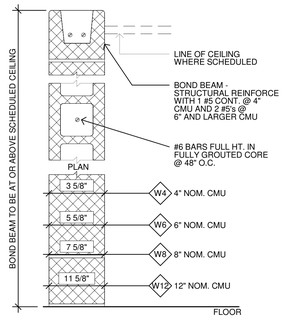


PARTITION TYPE "M"

25ga. METAL STUDS @ 16" O.C. WITH ONE (1) LAYER OF
5/8" THICK GYPSUM BOARD.

PARTITION TYPE	UNBRACED LIMITING HT.	MINIMUM STC REQUIRED
M1	8'-3"	38
M2	10'-9"	52
M3	13'-6"	54
M4	14'-3"	54
M6	15'-0"	54

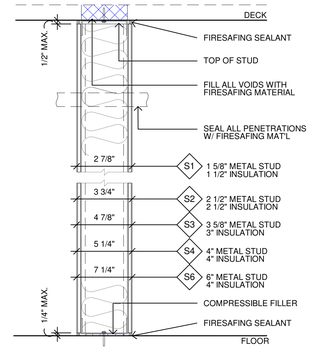
PARTITION TYPE "M"



PARTITION TYPE "W"

CONCRETE MASONRY UNIT WALL WITH HORIZONTAL
JOINT REINFORCING AT 16" O.C. VERTICAL

PARTITION TYPE "V"



PARTITION TYPE "S" (ONE (1) HIRE FIRE RATING)

25ga. METAL STUDS @ 16" O.C. WITH ONE (1) LAYER OF
5/8" THICK GYPSUM BOARD EACH SIDE.

PARTITION TYPE	UNBRACED LIMITING HT.	FIRE RATING @ DESIGNATED PARTITIONS. REFER TO PLANS NOTE:	MINIMUM STC REQUIRED
S1	8'-3"	PARTITION FIRE RATING IS	38
S2	10'-9"	BASED ON UL DESIGN NO.	52
S3	13'-6"	419. CONTRACTOR TO ADHERE	54
S4	14'-3"	TO UL DESIGN STANDARDS	54
S6	15'-0"	AT ALL TIMES.	54

PARTITION TYPE "S"

LOOSE ANGLE LINTEL SCHEDULE

CLEAR SPAN	STEEL ANGLES FOR 4" MASONARY WALL OPENINGS	NOTES:
4'-0" OR LESS	4" x 4"x 1/4"	1 THRU 8
4'-1" TO 5'-0"	4" x 4" x 1/4"	1 THRU 8
5'-1" TO 6'-0"	6" x 4" x 5/16"	1 THRU 8
6'-1" TO 7'-0"	6" x 4" x 5/16"	1 THRU 8
7'-1" TO 8'-0"	6" x 4" x 5/16"	1 THRU 8
8'-1" OR GREATER		9

NOTES:
1. PROVIDE 8" MIN. BEARING FOR ALL ANGLES.
2. PROVIDE CONTINUOUS LINTELS BETWEEN ADJACENT OPENINGS SEPARATED BY 2' 0" OR LESS
3. THIS SCHEDULE APPLIES ONLY TO NON LOAD BEARING WALLS.
4. ANY AND ALL LINTELS IN LOAD BEARING WALLS SHALL BE SCHEDULED AND DETAILED BY STRUCTURAL
5. IN CASES OF MASONRY VENEER WALLS WITH CMU BACK-UP THE VENEER LINTEL SHALL BE SELECTED PER THIS SCHEDULE. REFER TO STRUCTURAL FOR CMU LINTEL SCHEDULING AND DETAILING.
6. PROVIDE HORIZONTAL EXPANSION JOINTS AT EA. END OF LINTEL
7. PROVIDE END DAMS PER DIVISION SEVEN AND DETAILS
8. MEMBER SIZES INDICATED PER THIS SCHEDULE SHALL ONLY SUPPLEMENT INFORMATION FOUND ELSEWHERE IN THE CONSTRUCTION DOCUMENTS, AND SHALL NOT SUPERSEDE MEMBER SIZES NOTED ON SECTIONS, DETAILS, OR STRUCTURAL DRAWINGS.
9. REFER TO SECTIONS, DETAILS, AND STRUCTURAL DRAWINGS.

OPENING JAMB STUD FRAMING SCHEDULE

CLEAR OPENING WIDTH	MIN. NO. OF STUDS @ EA. JAMB	NOTES:
5'-4" OR LESS	2	1 THRU 4
5'-5" TO 8'-0"	3	1 THRU 4
8'-1" TO 10'-8"	4	1 THRU 4
10'-9" TO 13'-4"	5	1 THRU 4
13'-5" TO 16'-0"	6	1 THRU 4
16'-1" OR GREATER		5

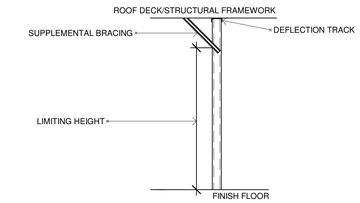
NOTES:
1. BASED ON 16" @ 24" O.C. STUD SPACING
2. THIS SCHEDULE APPLIES ONLY TO CFMF
3. JAMB STUDS ARE TO BE CONNECTED TO EACH OTHER
4. REFER TO PARTITION TYPES FOR SIZING AND SPACING OF WALL STUDS
5. REFER TO STRUCTURAL REINFORNCEMENT

GAUGE / THICKNESS SCHEDULE

US STANDARD GAUGE	MINIMUM BASE METAL THICKNESS	
	IN.	MIL.
26	.0179	18
25	.0209	21
24	.0239	24
22	.0299	30
20	.0359	36
18	.0478	48
16	.0598	60
14	.0747	75
12	.1046	105
10	.1345	135

SCHEDULES 3

A. BASE LIMITING HEIGHTS FOR PARTITIONS ON A DEFLECTION CRITERIA RATIO (L/360) OF LOAD WHERE FLOOR TO STRUCTURE HEIGHTS OF PARTITION EXCEEDS THE LIMITING HEIGHT. PROVIDE SUPPLEMENTAL BRACING TO THE STRUCTURE OVERHEAD AS REQUIRED TO MAINTAIN DEFLECTION RATIO (L/360) WITHIN LOAD.



B. FOR PARTITIONS WITH "BRITTLE" FINISHES SUCH AS PLASTER AND CERAMIC TILE, DESIGN PARTITION SYSTEM TO MAINTAIN DEFLECTION RATIO WITHIN LOAD.

C. SUSPENDED CEILINGS SHALL NOT BE CONSIDERED AS BRACING.

D. WHERE GYPSUM WALLBOARD IS THE SUBSTRATE FOR APPLICATION OF CERAMIC TILE. PROVIDE "WATER-RESISTANT, TYPE X" BOARD.

E. STC RATING SHOWN FOR SOUND WALLS ARE BASED ON LABORATORY TESTED ASSEMBLIES AND DO NOT NECESSARILY INDICATE THE ACTUAL STC RATING OF THE COMPLETED WORK.

F. PARTITIONS ARE NOT STRUCTURAL ELEMENTS, AND ARE NOT DESIGNED TO CARRY VERTICAL LOADS

DRYWALL PARTITION DESIGN CRITERIA 2

P1. Refer to index sheet G.001 for typical graphical symbols and abbreviation index.

P2. Refer to sheet G.020 for accessibility guidelines.

P3. All partitions in wet or moist locations will receive moisture resistant sheathing. Refer to plans and specifications for locations of wet or moist areas and material required.

P4. Refer to the enlarged floor plans for the locations of the partitions unless noted otherwise.

P5. Refer to this sheet for standard details pertaining to the partitions types. One or more of the details will pertain to each partition. It is the responsibility of the contractor to coordinate and reference all standard details to each partition. The contractor is to immediately contact the Architect if any questions arise.

P6. Refer to door schedules, window types, and details for construction of openings in the partitions.

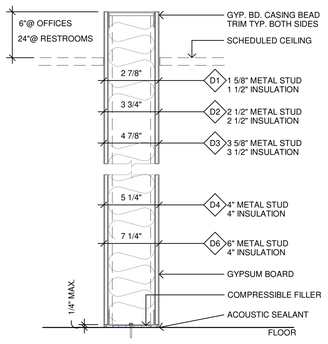
P7. For all smoke and/or fire rated partitions the designated UL design is to be maintained without exception. All penetrations and openings are to be sealed with an approved UL design or designated detail. These drawings do not list all the UL designs necessary to maintain a partition's smoke and/or fire rating. It is the responsibility of the General Contractor to ensure all rated partitions fully meet UL requirements.

P8. Adequate fire retardant blocking is required at every location where millwork, wall light fixtures, TV brackets, plumbing fixtures, etc. are to be mounted. Blocking is in addition to noted partition construction, and is not meant to replace the partition construction. Blocking is not to interfere or degrade a partition's smoke and/or fire rating.

P9. Provide corner guard at every corner of exposed gypsum wall board assembly. Re: Finish Plan.

P.10 Refer to 2/A.630 for drywall partition design limitations.

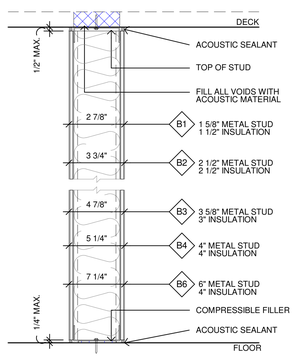
PARTITION GENERAL NOTES 1



PARTITION TYPE "D"

25ga. METAL STUDS @ 16" O.C. WITH ONE (1) LAYER OF
5/8" THICK GYPSUM BOARD EACH SIDE.

PARTITION TYPE	UNBRACED LIMITING HT.	MINIMUM STC REQUIRED
D1	8'-3"	38
D2	10'-9"	52
D3	13'-6"	54
D4	14'-3"	54
D6	15'-0"	54



PARTITION TYPE "J"

TWO 25ga. METAL STUD WALLS WITH STUDS AT
16" O.C. IN BOTH WALLS AND ONE LAYER OF
5/8" GYP. BD. ON EACH SIDE.

PARTITION TYPE	UNBRACED LIMITING HT.
J1	8'-3"
J2	10'-9"
J3	13'-6"

PARTITION TYPE "B"

25ga. METAL STUDS @ 16" O.C. WITH ONE (1) LAYER OF
5/8" THICK GYPSUM BOARD EACH SIDE.

PARTITION TYPE	UNBRACED LIMITING HT.	MINIMUM STC REQUIRED
B1	8'-3"	38
B2	10'-9"	52
B3	13'-6"	54
B4	14'-3"	54
B6	15'-0"	54

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE/ architecture

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Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
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STRUCTURAL
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HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
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HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
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SEAL:

REGISTERED ARCHITECT
FERNANDO L. BRAVE
14293
STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

PARTITION TYPES

Scale: AS NOTED

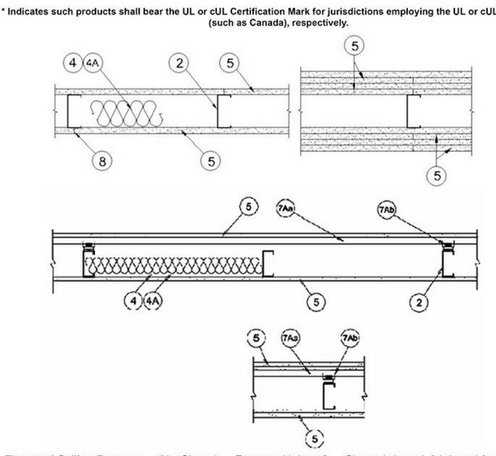
A.630

Design No. U419

April 24, 2019

Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr (See Items 4 & 5 through 5K)

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Floor and Ceiling Runners —** (Not Shown) — For use with Item 2 — Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth to accommodate stud size, with min 1-1/4 in. long legs, attached to floor and ceiling with fasteners 24 in. OC max.

1A. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 — For use with Item 2B, proprietary channel shaped runners, 3-5/8 in. deep attached to floor and ceiling with fasteners 24 in. OC max.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper25™ Track

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper25™ Track

FUSION BUILDING PRODUCTS — Viper25™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper25™ Track

1B. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 — For use with Item 2C, proprietary channel shaped runners, 1-1/4 in. wide by 3-5/8 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper20™ Track

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

FUSION BUILDING PRODUCTS — Viper20™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

1C. **Framing Members* — Floor and Ceiling Runners** — (Not Shown) — In lieu of Item 1 — Channel shaped, attached to floor and ceiling with fasteners 24 in. OC. max.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

1D. **Floor and Ceiling Runners** — (Not Shown) — For use with Item 2A — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min depth to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1E. **Framing Members* — Floor and Ceiling Runners** — (Not Shown, As an alternate to Item 1) — For use with Items 2E, 5F or 5G or 5I only, channel shaped, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC. max.
CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK

DMFCWBS L L C — ProTRAK

MBA METAL FRAMING — ProTRAK

RAM SALES L L C — Ram ProTRAK

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProTRAK

1F. **Framing Members* — Floor and Ceiling Runner —** Not Shown — In lieu of Item 1 — For use with Item 2F, proprietary channel shaped runners, minimum width to accommodate stud size, with 1- 1/8 in. long legs fabricated from min 0.015 in. (min bare metal thickness) galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
SUPER STUD BUILDING PRODUCTS — The Edge

1G. **Framing Members* — Floor and Ceiling Runner** — For use with Item 2G, proprietary channel shaped runners, minimum width to accommodate stud size attached to floor and ceiling with fasteners 24 in. OC max.
STUDCO BUILDING SYSTEMS — CROCSTUD Track

1H. **Floor and Ceiling Runners** — (Not Shown) — Channel shaped, fabricated from min 0.02 in. galv steel, min width to accommodate stud size, with min 1 in. long legs, for use with studs specified below and fabricated from min 0.018 in. galv steel or thicker, attached to floor and ceiling with fasteners spaced max 24 in. OC.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track VT100

FUSION BUILDING PRODUCTS — Viper20™ Track VT100

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track VT100

1I. **Framing Members* — Floor and Ceiling Runners —** (Not Shown, As an alternate to Item 1) — For use with Items 2H, channel shaped, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC. max.
TELLING INDUSTRIES L L C — TRUE-TRACK™

1J. **Framing Members* — Floor and Ceiling Runner** — Not Shown — In lieu of Item 1 — For use with Item 2I, proprietary channel shaped runners, 3-5/8 in. deep attached to floor and ceiling with fasteners 24 in. OC max.
TELLING INDUSTRIES L L C — Viper25™ Track

1K. **Framing Members* — Floor and Ceiling Runner** — Not Shown — In lieu of Item 1 — For use with Item 2J, proprietary channel shaped runners, 1-1/4 in. wide by 3-5/8 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
TELLING INDUSTRIES L L C — Viper20™ Track

1L. **Framing Members* — Floor and Ceiling Runner** — Not Shown — In lieu of Item 1 — For use with Item 2N, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-1/2 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
STEEL INVESTMENT GROUP L L C — AlphaTRAK

1M. **Framing Members* — Floor and Ceiling Runners** — Not Shown — As an alternate to Item 1 — For use with Item 2O, proprietary channel shaped runners, min width to accommodate stud size, galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
RONDO BUILDING SERVICES PTY LTD — Rondo Wall Track

1N. **Framing Members* — Floor and Ceiling Runners** — Not Shown — As an alternate to Item 1 — For use with Item 2P, proprietary channel shaped runners, min width to accommodate stud size, galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.
OEG BUILDING MATERIALS — OEG Track

1O. **Framing Members* — Floor and Ceiling Runner** — Not Shown — In lieu of Item 1 — For use with Item 2Q, proprietary channel shaped runners, min width to accommodate stud size, fabricated from min. 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper X Track

2. **Steel Studs** — Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

2A. **Steel Studs —** (As an alternate to Item 2, For use with Items 5B, 5E, 5H, 5J and 5K) — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height.

2B. **Framing Members* - Steel Studs** — (As an alternate to Item 2, For use with Items 5C, 5I or 5K) — Proprietary channel shaped studs, 3-5/8 in. deep spaced a max of 24 in. OC. Studs to be cut 3/4 in less than the assembly height and installed with a 1/2 in. gap between the end of the stud and track at the bottom of the wall. For direct attachment of gypsum board only.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper25™

CRACO MFG INC — SmartStud25™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper25™

FUSION BUILDING PRODUCTS — Viper25™

IMPERIAL MANUFACTURING GROUP INC — Viper25™

2C. **Framing Members* — Steel Studs —** Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max if 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper20™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

FUSION BUILDING PRODUCTS — Viper20™

IMPERIAL MANUFACTURING GROUP INC — Viper20™

2D. **Framing Members* — Steel Studs** — In lieu of Item 2 — Channel shaped studs, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

2E. **Framing Members* — Steel Studs** — (Not Shown, As an alternate to Item 2) — For use with Items 5F or 5G or 5I or 5K only, channel shaped studs, min depth as indicated under Item 5F, 5G or 5I, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

MBA METAL FRAMING — ProSTUD

RAM SALES L L C — Ram ProSTUD

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProSTUD

2F. **Framing Members* — Steel Studs** — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, minimum width indicated under Item 5, 1-1/4 in. deep fabricated from min 0.015 in. (min bare metal thickness) galvanized steel. Studs 3/8 in. to 3/4 in. less in lengths than assembly heights.
SUPER STUD BUILDING PRODUCTS — The Edge

2G. **Framing Members* — Steel Studs** — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, minimum width indicated under Item 5, Studs to be cut 3/8 to 3/4 in less than the assembly height.
STUDCO BUILDING SYSTEMS — CROCSTUD

2H. **Framing Members* — Steel Studs** — (Not Shown, As an alternate to Item 2) — Fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.
TELLING INDUSTRIES L L C — TRUE-STUD™

2I. **Framing Members* — Steel Studs —** (As an alternate to Item 2, For use with Items 5C or 5L or 5K) — Proprietary channel shaped studs, 3-5/8 in. deep spaced a max of 24 in. OC. Studs to be cut 3/4 in less than the assembly height and installed with a 1/2 in. gap between the end of the stud and track at the bottom of the wall. For direct attachment of gypsum board only.
TELLING INDUSTRIES L L C — Viper25™

2J. **Framing Members* — Metal Studs** — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max if 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights
TELLING INDUSTRIES L L C — Viper20™

2K. **Framing Members* — Steel Studs** — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
EB METAL INC — NITROSTUD

2L. **Framing Members* — Steel Studs** — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
OLMAR SUPPLY INC — PRIMESTUD

2M. **Framing Members* — Steel Studs** — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
MARINO/WARE, DIV OF WARE INDUSTRIES INC — StudRite™

2N. **Framing Members*— Steel Studs** — As an alternate to Item 2 — proprietary channel shaped steel studs, min depth 3-1/2 in. and as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in length than assembly height.
STEEL INVESTMENT GROUP L L C — AlphaSTUD

2O. **Framing Members* — Steel Studs** — As an alternate to Item 2 — proprietary channel shaped steel studs, min width as indicated under Item 5, galv steel. Studs to be cut 3/8 to 3/4 in. less in lengths than assembly height. Spaced 24 in. OC max.
RONDO BUILDING SERVICES PTY LTD — Rondo Lipped Wall Stud

2P. **Framing Members* — Steel Studs** — As an alternate to Item 2 — proprietary channel shaped steel studs, min width as indicated under Item 5, min 25 MSG galv steel. Studs to be cut 3/8 to 3/4 in. less in lengths than assembly height. Spaced 24 in. OC max.
OEG BUILDING MATERIALS — OEG Stud

2Q. **Framing Members* — Steel Studs** — Not Shown — In lieu of Item 2 — For use with Item 1O, proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min 25 MSG (0.018 in. min. bare metal thickness). Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.
CALIFORNIA EXPANDED METAL PRODUCTS CO — Viper X

3. **Wood Structural Panel Sheathing** — (Optional, For use with Item 5 Only) — (Not Shown) — 4 ft wide, 7/16 in. thick oriented strand board (OSB) or 15/32 in. thick structural 1 sheathing (plywood) complying with DOC PS1 or PS2, or APA Standard PRP-108, manufactured with exterior glue, applied horizontally or vertically to the steel studs. Vertical joints centered on studs, and staggered one stud space from wallboard joints. Attached to studs with flat-head self-drilling tapping screws with a min. head diam. of 0.292 in. at maximum 6 in. OC. in the perimeter and 12 in. OC. in the field. When used, gypsum panels attached over OSB or plywood panels and fastener lengths for gypsum panels increased by min. 1/2 in.

4. **Batts and Blankets*** — (Required as indicated under Item 5) — Mineral wool batts, friction fitted between studs and runners. Min nom thickness as indicated under Item 5.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

4A. **Batts and Blankets*** — (Optional) — Placed in stud cavities, any glass fiber or mineral wool insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

4B. **Batts and Blankets*** — For use with Item 5K. Placed in stud cavities, any min. 3-1/2 in. thick glass fiber insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

4C. **Fiber, Sprayed*** — (Optional) and as an alternate to Batts and Blankets (Item 4B) where insulation is required - Spray applied granulated mineral fiber material. The fiber is applied with adhesive at a minimum density of 4.0 pcf to completely fill the wall cavity in accordance with the application instructions supplied with the product. See **Fiber, Sprayed** (CCAZ).
AMERICAN ROCKWOOL MANUFACTURING, LLC — Type Rockwool Premium Plus

5. **Gypsum Board*** — Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. The thickness and number of layers for the 1 hr, 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Items 2, 2C, 2D, 2F, 2G, 2O	No. of Layers & Thkns of Panel	Min Thkns of Insulation (Item 4)
1	3-1/2	1 layer, 5/8 in. thick	Optional
1	2-1/2	1 layer, 1/2 in. thick	1-1/2 in.
1	1-5/8	1 layer, 3/4 in. thick	Optional
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional
2	3-1/2	1 layer, 3/4 in. thick	3 in.
3	1-5/8	3 layers, 1/2 in. thick	Optional
3	1-5/8	2 layers, 3/4 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 1/2 in. thick	Optional
4	2-1/2	2 layers, 3/4 in. thick	2 in.

CGC INC — 1/2 in. thick Type C, IP-X2 or IPC-AR; WRC, 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRX or WRC; 3/4 in. thick Types IP-X3 or ULTRACODE

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or WRC; 5/8 in. thick Type SCX, SGX, SHX, WRX, IP-X1, AR, C, WRC, FRX-G, IP-AR, IP-X2, IPC-AR; 3/4 in. thick Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, ULTRACODE

USG MEXICO S A DE C V — 1/2 in. thick Type C, IP-X2, IPC-AR or WRC; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRX, WRC or; 3/4 in. thick Types IP-X3 or ULTRACODE

When Item 7B, **Steel Framing Members***, is used, Nonbearing Wall Rating is limited to 1 Hr. Min. stud depth is 3-1/2 in., min. thickness of insulation (Item 4) is 3 in., and two layers of gypsum board panels (1/2 in. or 5/8 in. thick) shall be attached to furring channels as described in Item 6. One layer of gypsum board panels (1/2 in. or 5/8 in. thick) attached to opposite side of stud without furring channels as described in Item 6.

5A. **Gypsum Board*** — (As an alternate to Item 5) — 5/8 in. thick, 24 to 54 in. wide, applied horizontally as the outer layer to one side of the assembly. Secured as described in Item 6.
CGC INC — Type SHX.

UNITED STATES GYPSUM CO — Type FRX-G, SHX.

USG MEXICO S A DE C V — Type SHX.

5B. **Gypsum Board*** — (Not Shown) — As an alternate to Item 5 when used as the base layer on one or both sides of wall when 5/8 in or 3/4 in. thick products are specified. For direct attachment only to steel studs Item 2A, (not to be used with Item 3) — Nom 5/8 in. or 3/4 in. may be used as alternate to all 5/8 in. or 3/4 in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 in. or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to 20 MSG steel studs Item 2A with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 11) or Lead Discs or Tabs (see Item 12).
RAY-BAR ENGINEERING CORP — Type RB-LBG

5C. **Gypsum Board*** — (For Use With Item 2B) — Rating Limited to 1 Hour. 5/8 in. thick, 48 in. wide, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. (Vertical Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. Vertical joints are to be centered over studs and staggered one stud cavity on opposite sides of studs. (Horizontal Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. All horizontal joints are to be backed as outlined under section VI of Volume 1 in the Fire Resistive Directory.
CGC INC — Type SCX.

UNITED STATES GYPSUM CO — Type SCX, SGX.

USG BORAL DRYWALL SFZ LLC — Type SCX

USG MEXICO S A DE C V — Type SCX

5D. **Gypsum Board* —** (As an alternate to Item 5) — 5/8 in. thick, 48 in. wide, applied vertically or horizontally. Secured as described in Item 6. For use with Items 1 and 2 only.
CGC INC — Type USGX

UNITED STATES GYPSUM CO — Type USGX

USG BORAL DRYWALL SFZ LLC — Type USGX

USG MEXICO S A DE C V — Type USGX

5E. **Gypsum Board*** — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 1/2 in. or 5/8 in thick products are specified, For direct attachment only to steel studs Item 2A, not to be used with Item 3). Nominal 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 (or No. 6 by 1-1/4 in. long bugle head fine driller) steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.
NEW ENGLAND LEAD BURNING CO INC, DBA NELCO — Nelco

5F. **Gypsum Board*** — (As an alternate to Item 5) — For use with Items 1E and 2E and limited to 1 Hour Rating only, Gypsum panels with beveled, square or tapered edges, applied vertically, and fastened to the steel studs with 1 in. long Type S screws spaced 8 in. OC along vertical and bottom edges and 12 in. OC in the field. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Steel stud depth shall be a minimum 3-5/8 in.
UNITED STATES GYPSUM CO — 5/8 in. thick Type SCX, SGX

USG BORAL DRYWALL SFZ LLC — 5/8 in. thick Type SCX, SGX

5G. **Gypsum Board*** — (As an alternate to Item 5) — For use with Items 1E and 2E only, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally, as specified in the table below and fastened to the steel studs as described in Item 6. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. The thickness and number of layers for the 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Item 2E	No. of Layers & Thickness of Panel	Min Thkns of Insulation (Item 4)
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional
3	1-5/8	3 layers, 1/2 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 1/2 in. thick	Optional

CGC INC — 1/2 in. thick Type C, IP-X2 or IPC-AR;, 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, or; 3/4 in. thick Types IP-X3 or ULTRACODE

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or; 5/8 in. thick Type SCX, SGX, SHX, IP-X1, AR, C, , FRX-G, IP-AR, IP-X2, IPC-AR, ULIX; 3/4 in. thick Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, ULTRACODE

USG MEXICO S A DE C V — 1/2 in. thick Type C, IP-X2, IPC-AR or; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, or; 3/4 in. thick Types IP-X3 or ULTRACODE

5H. **Gypsum Board*** — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 5/8 or 3/4 in thick products are specified, For direct attachment only to steel studs Item 2A, (not to be used with Item 3) - Nom 5/8 or 3/4 in. may be used as alternate to all 5/8 or 3/4 in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Gypsum board secured to 20 MSG steel studs Item 2B with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. For Joint Compound see Item 5. To be used with Lead Batten Strips (see Item 11A) or Lead Discs (see Item 12A).
MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

5I. **Gypsum Board*** — (As an alternate to Item 5) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges installed as described in Item 5. Steel stud minimum depth shall be as indicated in Item 5.
CGC INC — Type ULX

UNITED STATES GYPSUM CO — Type ULX
USG MEXICO S A DE C V — Type ULX

5J. **Gypsum Board*** — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 1/2 in. or 5/8 in thick products are specified, For direct attachment only to steel studs Item 2A, not to be used with Item 3). Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".
RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

5K. **Gypsum Board*** — (Not Shown) — (As an alternate to Item 5) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) need not be staggered. The number of layers for the 1 hr, 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Items 2 through 2O	No. of Layers & Thkns of Panel	Min Thkns of Insulation (Item 4B)
1	3-5/8	1 layer, 5/8 in. thick	3-1/2 in.
2	1-5/8	2 layers, 5/8 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional

UNITED STATES GYPSUM CO — 5/8 in. thick Type ULIX

6. **Fasteners** — (Not Shown) — For use with Items 2 and 2F - Type S or S-12 steel screws used to attach panels to studs (Item 2) or furring channels (Item 7). **Single layer systems:** 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 8 in. OC when panels are applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. **Two layer systems:** First layer- 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 6 in. from first layer.**Three-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in., 5/8 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. **Four-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 24 in. OC. Fourth layer- 2-5/8 in. long for 1/2 in. thick panels or 3 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below.

7. **Furring Channels** — (Optional, Not Shown, for single or double layer systems) — Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 1/2 in. long Type S-12 steel screws. Not for use with Item 5A.

7A. **Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Aa) to studs (Item 2). Clips spaced max. 48 in. OC. RSIC-1 and RSIC-1 (2.75) clips secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. RSIC-V and RSIC-V (2.75) clips secured to studs with No. 8 x 9/16 in. minimum self-drilling, S-12 steel screw through the center hole. Furring channels are friction fitted into clips. RSIC-1 and RSIC-V clips for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) and RSIC-V (2.75) clips for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-V, RSIC-1 (2.75), RSIC-V (2.75).

7B. **Framing Members*** — (Optional, Not Shown) — As an alternate to Item 7, for single or double layer systems, furring channels and Steel Framing Members on only one side of studs as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Batts and Blankets placed in stud cavity as described in Item 5. Two layers of gypsum board attached to furring channels as described in Item 5. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ba) to one side of studs (Item 2) only. Clips spaced 48 in. OC., and secured to studs with two No. 8 x 2-1/2 in. coarse drywall screws, one through the hole at each end of the clip. Furring channels are friction fitted into clips.
KINETICS NOISE CONTROL INC — Type Isomax

7C. **Framing Members*** — (Not Shown) — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ca) to studs (Item 2). Clips spaced max. 48 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.
PLITEQ INC — Type GENIECLIP

7D. **Steel Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Da) to studs. Clips spaced 48 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips
STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237 or A237R

7E. **Steel Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 7Eb. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A and 5E.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ea) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.
REGUPOL AMERICA — Type SonusClip

7F. **Steel Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — Resilient channels and Steel Framing Members as described below:

a. **Resilient Channels** — Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 5. Not for use with Item 5A and 5E.

b. **Steel Framing Members*** — Used to attach resilient channels (Item 7Fa) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.
KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

7G. **Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. or 1-1/2 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ga) to studs (Item 2). Clips spaced max. 48 in. OC. Clips secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center hole. Furring channels are friction fitted into clips.
CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

8. **Joint Tape and Compound** — Vinyl or casein, dry or premixed joint compound applied in two coats to joints and screw heads of outer layers. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layer panels. Paper tape and joint compound may be omitted when gypsum panels are supplied with a square edge.

9. **Siding, Brick or Stucco** — (Optional, Not Shown) — Aluminum, vinyl or steel siding, brick veneer or stucco, meeting the requirements of local code agencies, installed over gypsum panels. Brick veneer attached to studs with corrugated metal wall ties attached to each stud with steel screws, not more than each sixth course of brick.

10. **Caulking and Sealants*** — (Optional, Not Shown) — A bead of acoustical sealant applied around the partition perimeter for sound control.
UNITED STATES GYPSUM CO — Type AS

11. **Lead Batten Strips** — (Not Shown, For Use With Item 5B) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5B) and optional at remaining stud locations. Required behind vertical joints.

11A. **Lead Batten Strips** — (Not Shown, For Use With Item 5H) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations.

12. **Lead Discs or Tabs** — (Not Shown, For Use With Item 5B) — Used in lieu of or in addition to the lead batten strips (Item 11) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 5B) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

12A. **Lead Discs** — (Not Shown, for use with Item 5H) — Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

13. **Lead Batten Strips** — (Not Shown, For Use With Item 5E) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.142 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5E) and optional at remaining stud locations.

14. **Lead Tabs** — (Not Shown, For Use With Item 5E) — 2 in. wide, 5 in. long with a max thickness of 0.142 in. Tabs friction-fit around front face of stud, the stud folded back flange, and the back face of the stud. Tabs required at each location where a screw (that secures the gypsum boards, Item 5E) will penetrate the steel stud. Lead tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead tabs may be held in place with standard adhesive tape if necessary.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

TYPE "U438"

1

JC DIVERSION CENTER RENOVATION

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Civil Contact

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KW LANDSCAPE ARCHITECTS
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MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
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SEAL:

DOCUMENT IS HEREBY INCLUDED AS REFERENCE ONLY

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

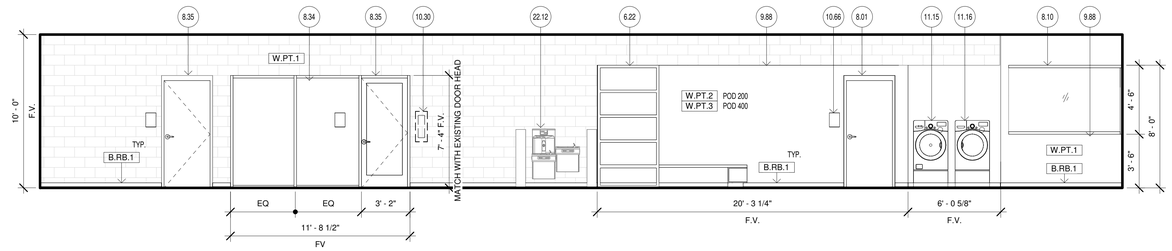
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

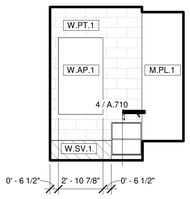
UL FIRE RATED ASSEMBLIES

Scale: AS NOTED

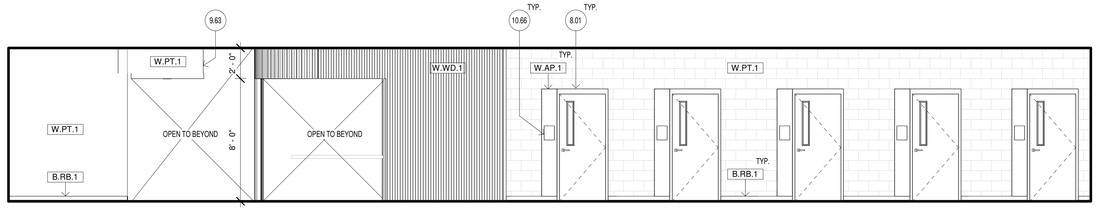
A.631



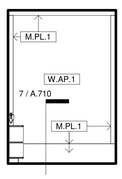
CORRIDOR 202 WEST 1/4" = 1'-0" 8



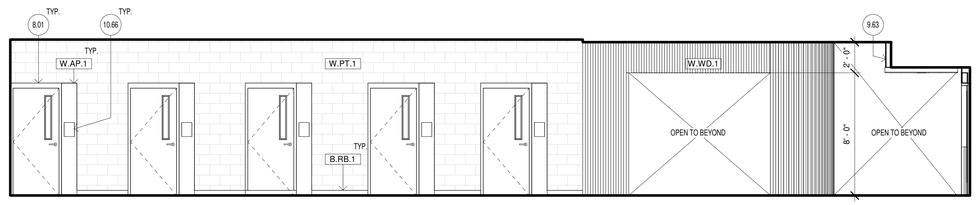
UNIT LEFT 1/4" = 1'-0" 19



CORRIDOR 202 EAST 1/4" = 1'-0" 7



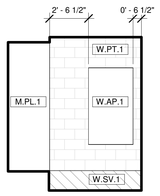
UNIT BACK 1/4" = 1'-0" 18



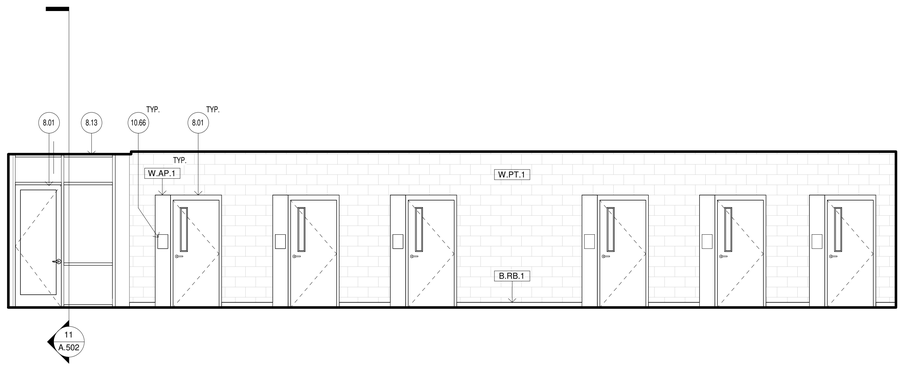
CORRIDOR 201 WEST 1/4" = 1'-0" 6

6.22	Millwork; re: Millwork details
8.01	Scheduled door; Re: Door schedule
8.10	Scheduled window, re: Window schedule
8.13	Scheduled glazing system, re: Window schedule
8.34	Existing window
8.35	Existing door
9.63	Gypsum board furrdown
9.88	Scheduled partition; re: Partition types
10.30	Wall-hung fire extinguisher (FE)
10.66	Room signage; re: Signage schedule and Door schedule
11.15	Washer-Owner Provided Contractor Installed
11.16	Dryer - Owner Provided Contractor Installed
22.12	Bi-level electric water cooler; re: Plumbing

KEYNOTES 2



UNIT RIGHT 1/4" = 1'-0" 17



CORRIDOR 201 EAST 1/4" = 1'-0" 5

LEGEND 1

JC DIVERSION CENTER RENOVATION

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DATACOM DESIGN GROUP
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SEAL:

REGISTERED ARCHITECT FERNANDO L. BRAVE 14293 STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: EH
CHECKED BY: ND

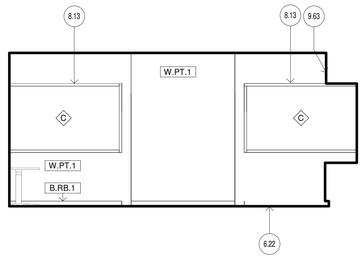
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

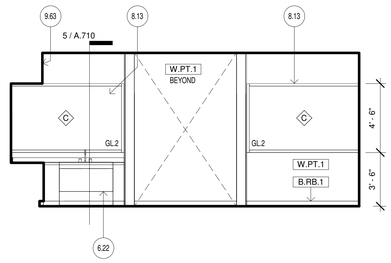
INTERIOR ELEVATIONS

Scale: AS NOTED

A.701



CONTROL EAST 1/4" = 1'-0" 12



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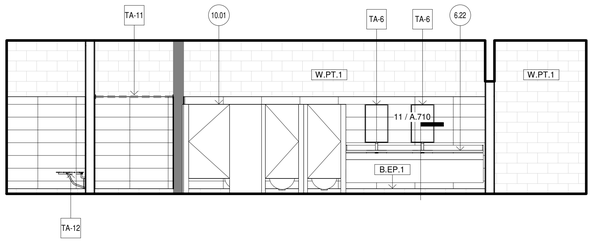
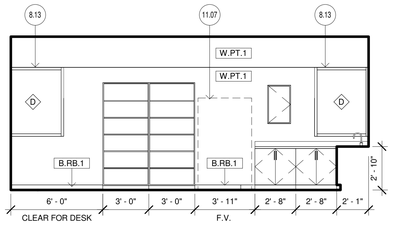
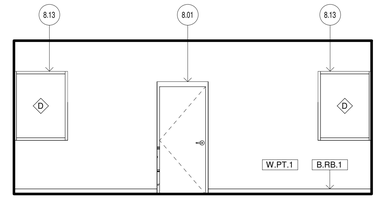


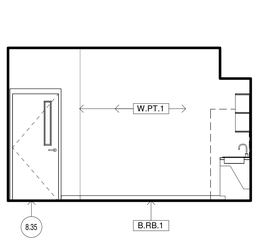
TOILET/SHOWERS WEST 1/4" = 1'-0" 15



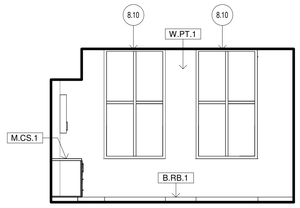
CONTROL SOUTH 1/4" = 1'-0" 11



CONTROL NORTH 1/4" = 1'-0" 7



GROUP WEST 1/4" = 1'-0" 18



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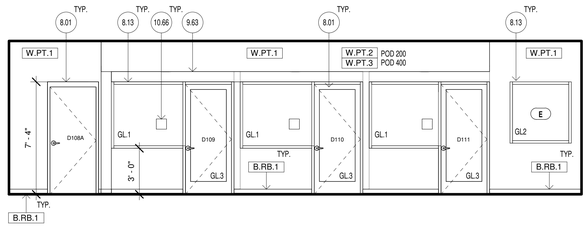
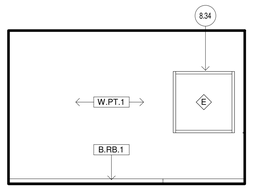


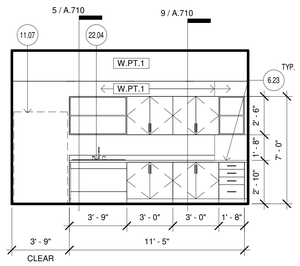
OFFICES ELEVATION 1/4" = 1'-0" 6

6.22	Millwork; re: Millwork details
6.23	Base cabinets; re: Millwork details
8.01	Scheduled door; Re: Door schedule
8.10	Scheduled window, re: Window schedule
8.13	Scheduled glazing system, re: Window schedule
8.34	Existing window
8.35	Existing door
9.63	Gypsum board furrdown
10.01	Toilet partition(s) , re: Accessory schedule
10.66	Room signage; re: Signage schedule and Door schedule
11.07	Refrigerator - Owner Provided Contractor Installed
11.23	Wall-mounted flat panel television
22.04	Two-compartment sink; re: Plumbing
25.10	Scheduled light fixture re: Electrical

KEYNOTES 2



GROUP SOUTH 1/4" = 1'-0" 17



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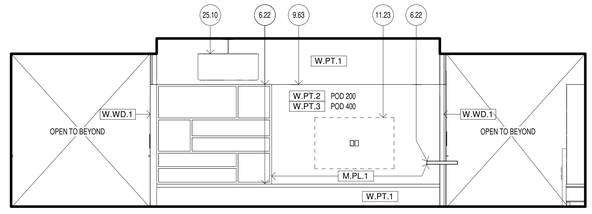

DAY ROOM SOUTH 1/4" = 1'-0" 5

GENERAL NOTES 1

JC DIVERSION CENTER RENOVATION

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HOUSTON, TX 77067
MEP Contact

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PRICE CONSULTING, INC
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AV/IT CONSULTANT
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Consultant Contact

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FEHMI NDOL BRAVE
14293
STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: EH
CHECKED BY: ND

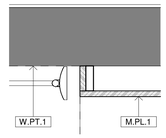
ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

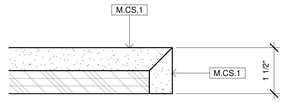
INTERIOR ELEVATIONS

Scale: AS NOTED

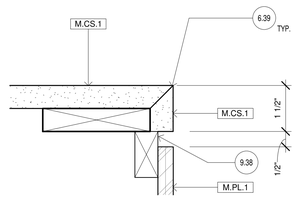
A.702



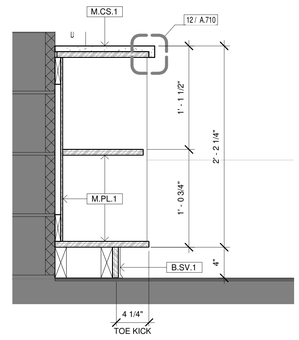
BED HEADER DETAIL 1 1/2" = 1'-0" 16



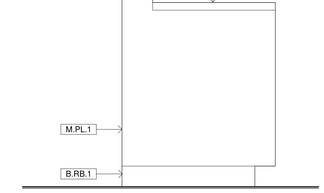
COUNTER EDGE DETAIL 2 6" = 1'-0" 12



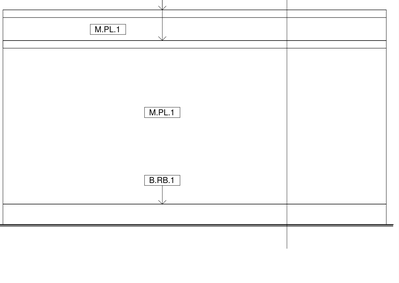
COUNTER EDGE DETAIL 6" = 1'-0" 8



NIGHTSTAND SECTION 1 1/2" = 1'-0" 4

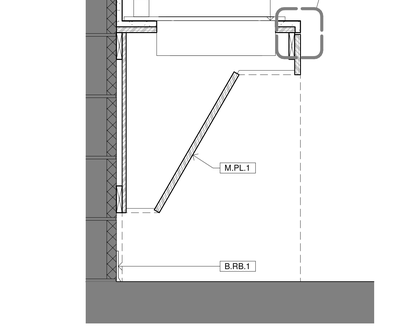


CONTROL ROOM MILLWORK PLAN 1/2" = 1'-0" 19



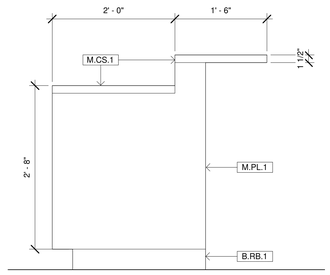
CONTROL ROOM MILLWORK SECTION 1" = 1'-0" 15

RESTROOM COUNTER MILLWORK 1 1/2" = 1'-0" 11

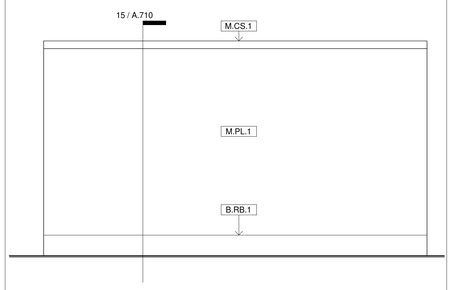


UNIT BED SECTION 1 1/2" = 1'-0" 7

UNIT BED EDGE DETAIL 6" = 1'-0" 3



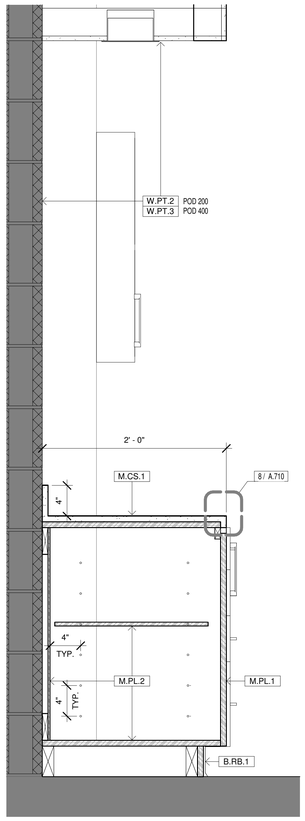
CONTROL ROOM MILLWORK 1" = 1'-0" 18



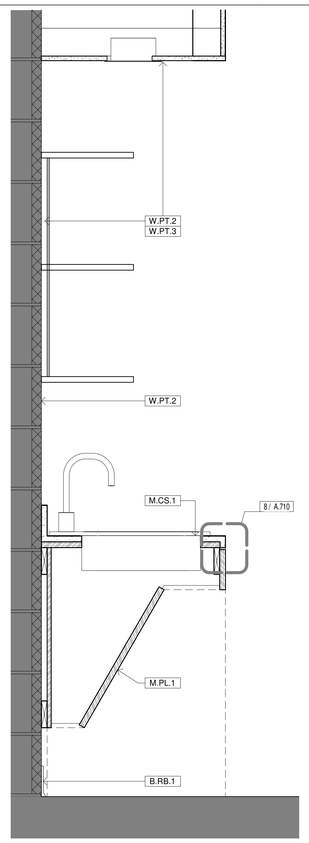
CONTROL ROOM MILLWORK 1" = 1'-0" 14

CONTROL ROOM MILLWORK 1" = 1'-0" 17

CONTROL ROOM MILLWORK 1" = 1'-0" 13



MILLWORK SECTION TYP. 1 1/2" = 1'-0" 9



ADA SINK MILLWORK 1 1/2" = 1'-0" 5

6.29 Half bullnose edge, stained, re: Millwork details
6.39 Countertop; re: Millwork details & Finish schedule
9.38 Reveal, painted

KEYNOTES 2

LEGEND 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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REGISTERED ARCHITECT FERNANDO L. BRAVE 14292 STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

05/02/2024	SCHEMATIC DESIGN
06/14/2024	DESIGN DEVELOPMENT
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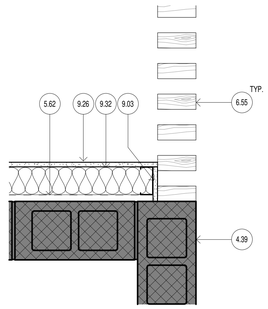
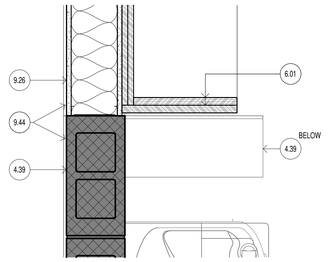
MILLWORK DETAILS

Scale: AS NOTED

A.710



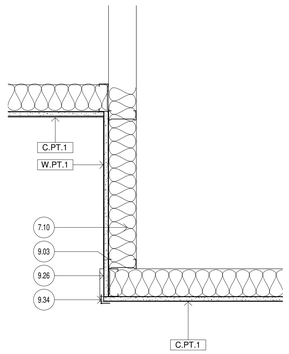
DETAIL @ SLAT WALL 1 1/2" = 1'-0" | 7



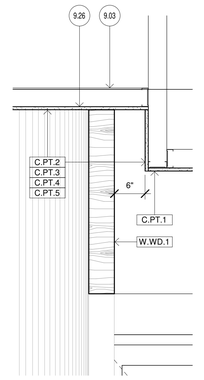
DETAIL @ CMU INFILL 1 1/2" = 1'-0" | 6

4.39	Existing 8" thick running bond CMU; re: Finish Schedule
5.62	7/8" Hat channel
6.01	3/4" plywood, painted; re: Finish schedule
6.55	2 x wood slat wall; re: Finish Schedule
7.10	Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
9.03	3-5/8" metal studs at 16" O.C. Maximum
9.26	5/8" gypsum board
9.32	Sound attenuation batts; depth of batts to match depth of wall stud, unless noted otherwise
9.34	Corner bead
9.44	Ceramic tile, re: Finish schedule

KEYNOTES 2



SECTION @ FURR DOWN 1 1/2" = 1'-0" | 9



WALL SECTION - SLATS @ OPENING 1" = 1'-0" | 5

LEGEND 1

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FEMMI DOLBRAVE
14293
STATE OF TEXAS

09/23/2024

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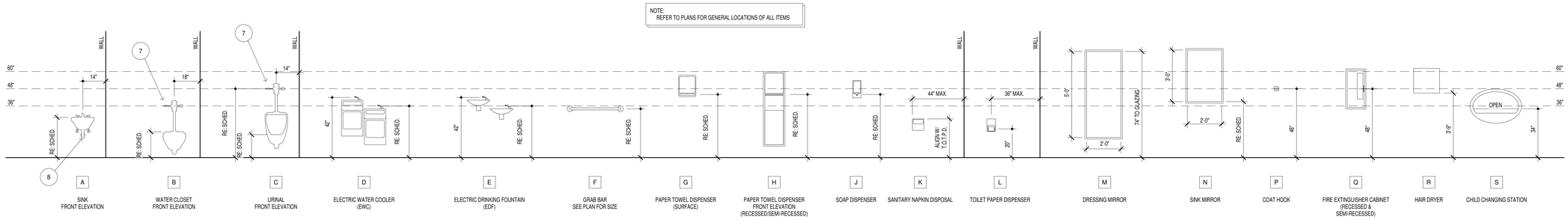
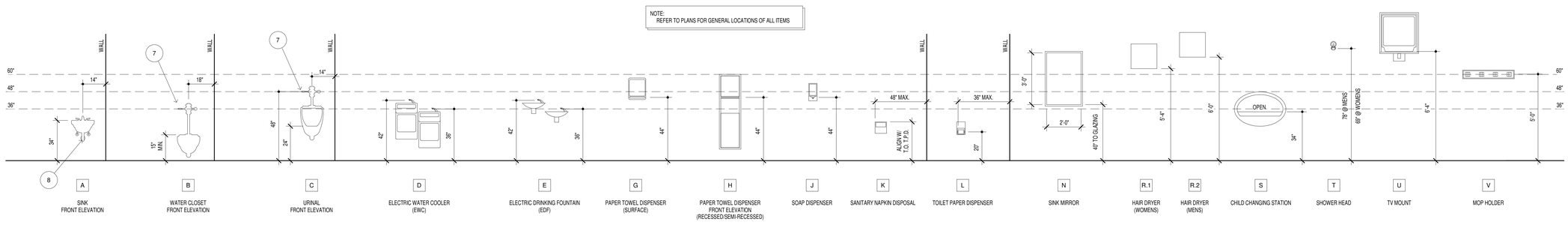
MILLWORK DETAILS

Scale: AS NOTED

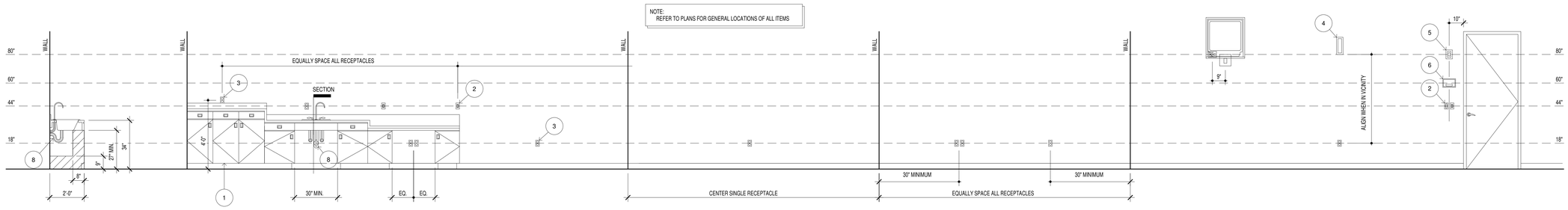
A.711



ACCESSIBLE MOUNTING HEIGHTS



STANDARD MOUNTING HEIGHTS



ELECTRICAL STANDARD MOUNTING HEIGHTS

ACCESSIBLE MOUNTING HEIGHTS SCHEDULE

ITEM AND DESCRIPTION			ADULTS
WATER CLOSET: MAX. A.F.F. TOP OF SEAT			17" - 19"
URINAL: MAX. A.F.F. TOP OF BASIN			16"
GRAB BARS MAX. A.F.F. TOP OF SEAT			34"
LAVATORIES:			
FRONT APPROACH: (PREFERRED)			
MIN. KNEE CLEARANCE			27"
MAX. TO TOP OF BASIN			34"
MAX. TO FAUCET FROM FRONT LIP			20"
SIDE APPROACH:			
MAX. TO TOP OF BASIN			34"
MAX. TO FAUCET FROM FRONT LIP			16"
MIRROR: MAX. A.F.F. TO REFLECT SURFACE			40"
CONTROL & ACCESSORIES (A.F.F.)			
FRONT APPROACH (PREFERRED)			48"
FRONT APPROACH (OBSTRUCTED)			44"
SIDE APPROACH			54"
DRINKING FOUNTAINS: MAX. A.F.F. TO SPOUT			36"
SWITCHES, OUTLETS, CONTROLS, ETC.			
MAX. FRONT APPROACH (PREFERRED)			48"
MAX. FRONT APPROACH (OBSTRUCTED)			44"
MIN. FRONT APPROACH			15"
MAX. SIDE APPROACH			48"
MIN. SIDE APPROACH			15"
TURNING RADIUS:			60"
CLEAR FLOOR AREA: AT ALL FIXTURES			30" X 48"

KEYED NOTES:

1. Millwork shown for reference. Refer to plans, elevations, and casework schedule for actual location and sizes.
2. Scheduled light switch/thermostat control. Re: MEP.
3. Scheduled receptacle. Re: MEP for quantity and general location of receptacle.
4. Scheduled wall mounted light fixture. minimum height when fixture extends more than 4" from the face of the wall. Re: MEP and architectural floor plans and elevations for actual location.
5. Scheduled emergency light strobe. Re: MEP.
6. Scheduled wall signage plaque. Refer to TAS guidelines and signage schedule.
7. Provide flush valve on wide (away from wall) side.
8. Provide scheduled thermal protection of pipes under all sinks and lavatories. Re: MEP.

GENERAL NOTES:

A. Refer to the tas accessibility guidelines sheet for all TDLR and TAS related questions not shown on this sheet. Immediately bring to the attention of the Architect any discrepancies between the mounting heights shown on this sheet and the guidelines prior to the commencement of work.

B. It is the responsibility of the General Contractor to ensure all trades center & align all items in each room and in the building as shown on this sheet. It is the Architect's intent to have consistent placement of all items In each room, and from room to room. The contractor must immediately report to the Architect any situation in which these placement standards are not feasible prior to commencement of work. No exceptions will be allowed for TDLR accessible required items.

C. Refer to accessory and equipment schedules for all scheduled items.

JC DIVERSION CENTER RENOVATION

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CHECKED BY: Checker

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STANDARD MOUNTING, LOCATIONS & TOILET ROOM CONFIGURATION

Scale: AS NOTED

A.730

DOOR & FRAME SCHEDULE - EXTERIOR DOORS

DOOR NO.	ROOM NAME	DOORS SIZE W	H	T	TYPE	MATL	FN	FRAME TYPE	MATL	FN	DETAIL H	J	S	GLASS	HARDWARE	REMARKS
X100	DAY ROOM	3' - 0"	8' - 0"	0' - 1 3/4"	D	HM		2	HM		10/A.611	11/A.611	6/A.820	GL4	2.0	CARD READER, KNOX BOX
X101	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	4.0	CARD READER
X102	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	3.0	CARD READER
X200	DAY ROOM	3' - 0"	8' - 0"	0' - 1 3/4"	D	HM		2	HM		10/A.611	11/A.611	6/A.820	GL4	2.0	CARD READER, KNOX BOX
X201	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	4.0	CARD READER
X202	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	3.0	CARD READER, KNOX BOX
X300	DAY ROOM	3' - 0"	8' - 0"	0' - 1 3/4"	D	HM		2	HM		10/A.611	11/A.611	6/A.820	GL4	2.0	CARD READER
X301	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	4.0	CARD READER
X302	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	3.0	CARD READER
X400	DAY ROOM	3' - 0"	8' - 0"	0' - 1 3/4"	D	HM		2	HM		10/A.611	11/A.611	6/A.820	GL4	2.0	CARD READER, KNOX BOX
X401	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	4.0	CARD READER
X402	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	B	HM		1	HM		12/A.611	16/A.611	6/A.820	GL4	4.0	CARD READER
XD001		4' - 0"	8' - 0"	0' - 2 3/4"	R									-		DOUBLE DOORS
XD002		4' - 0"	8' - 0"	0' - 2 3/4"	R									-		DOUBLE DOORS
XD120	MECHANICAL	3' - 0"	7' - 0"	0' - 1 3/4"	E	HM		3	HM		12/A.611	16/A.611	6/A.820	-	1.0	DOUBLE DOORS, CARD READER
XD137	MECHANICAL	3' - 0"	7' - 0"	0' - 1 3/4"	E	HM		3	HM		12/A.611	16/A.611	6/A.820	-	1.0	DOUBLE DOORS, CARD READER

EXTERIOR DOORS NOTE:
AT ALL EXTERIOR DOORS INSTALL A DOOR TOP WEATHER STRIP (DRIP CAP) ATTACHED TO HEAD OF DOOR FRAME EQUAL TO PEMCO 346D LENGHT EQUAL TO WIDTH OF DOOR FRAME.

DOOR & FRAME SCHEDULE - INTERIOR DOORS

DOOR NO.	ROOM NAME	DOORS SIZE W	H	T	TYPE	MATL	FN	FRAME TYPE	MATL	FN	DETAIL H	J	S	GLAZING	HARDWARE	SIGNAGE	REMARKS
203	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
204	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
205	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
206	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
207	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
208	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
209	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
210	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
211	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
212	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
213	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
214	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
215	ADA ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
217	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
218	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
219	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
403	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
404	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
405	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
406	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
407	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
408	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
409	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
410	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
411	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
412	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
413	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
414	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
415	ADA ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
417	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
418	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
419	ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	7/A.821		GL2	9.0	S2	KEYED DOORS
D101	GROUP	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		8/A.821	9/A.821		GL2			KEYED DOORS
D107	STAFF TOILET	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		3/A.821	4/A.821		-	8.0		LOCKABLE FROM INSIDE
D108A	CONTROL	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		3/A.821	4/A.821		-	5.0	S2	CARD READER
D108B	CONTROL	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		3/A.821	4/A.821		-	5.0	S2	CARD READER
D109	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D110	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D111	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D112	MR ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	6/A.821		GL2	11.0	S2	
D114A	TOILET/SHOWERS	3' - 0"	7' - 0"	0' - 1 3/4"	A	WD		1	HM		3/A.821	4/A.821		-	12.0	S3	
D119	CUSTODIAL	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		5/A.821	6/A.821		-	7.0	S2	
D121	MECHANICAL CHASE	2' - 0"	7' - 0"	0' - 1 3/4"	A	HM		1	HM		5/A.821	6/A.821		-			SERVICE DOOR
D126	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D127	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D128	OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		4	HM		10/A.821	11/A.821		GL3	5.0	S2	CARD READER
D129	GROUP	3' - 0"	7' - 0"	0' - 1 3/4"	B	WD		1	HM		5/A.821	6/A.821		GL2	11.0	S2	KEYED DOORS
D131A	TOILET/SHOWERS	3' - 0"	7' - 0"	0' - 1 3/4"	A	WD		1	HM		3/A.821	4/A.821		-	12.0	S3	
D134	GROUP	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		5	HM		8/A.821	9/A.821		GL2	10.0	S2	
D136	CUSTODIAL	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		5/A.821	6/A.821		-	7.0	S2	
D138	MECHANICAL CHASE	2' - 0"	7' - 0"	0' - 1 3/4"	A	HM		1	HM		5/A.821	6/A.821		-			SERVICE DOOR
D139	SPRINKLER ROOM	3' - 0"	7' - 0"	0' - 1 3/4"	C	WD		1	HM		5/A.821	6/A.821		-	6.0	S2	CARD READER
D220	MANAGER OFFICE	3' - 0"	7' - 2"	0' - 1 3/4"	D	HM		5	HM		8/A.821	9/A.821		GL3	5.0	S2	CARD READER

INTERIOR DOOR - WINDOW FRAME NOTE:
INSTALL MANUAL ROLLER SHADES AT ALL INTERIOR WINDOWS AND DOOR-WINDOW FRAMES.

EXTERIOR & INTERIOR DOOR SCHEDULE 11

Manufacturer List

MK	McKinney
OT	Other
PE	Pemko
RO	Rockwood
SA	SARGENT
SU	Securitron

Set: 1.0
Description: EXT HM PR - CR LOCKSET - MFB - CPS

Qty	Item	Description	Finish	Mfr
3	Hinge (heavy weight)	T4A3386	US32D	MK
1	Hinge, Full Mortise, Hvy Wt [Elec]	T4A3386 QCxx	US32D	MK
2	Flush Bolt	555 / 557 (As req'd) - 12" / 72" AFF	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Overhead Stop	590S	EN	SA
1	Surface Closer w Stop	351 CPS	EN	SA
2	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Astragal	355CS x Height		PE
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
2	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 2.0
Description: EXT SGL - RATED - CR EXIT - WS

Qty	Item	Description	Finish	Mfr
1	Continuous Hinge	CFM _ HD1 SER		PE
1	Rim Exit, ST	DG1 12 55 56 PE8804	US32D	SA
1	Pull	RM201	US32D	RO
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Sweep	315CN x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 3.0
Description: EXT SGL - CR EXIT - CPS

Qty	Item	Description	Finish	Mfr
1	Continuous Hinge	CFM _ HD1 SER		PE
1	Rim Exit, ST	DG1 55 56 PE8804	US32D	SA
1	Pull	RM201	US32D	RO
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
1	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 4.0
Description: EXT SGL - EO EXIT - CPS

Qty	Item	Description	Finish	Mfr
1	Continuous Hinge	CFM _ HD1		PE
1	Rim Exit, EO	PE8810	US32D	SA
1	Surface Closer w Stop	351 CPS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	2891APK (Head & Jambs)		PE
1	Rain Guard	346C x Width		PE
1	Sweep	3452AV x Width		PE
1	Threshold	2005AT x Width		PE
1	Position Switch	DPS-M/W-WH (as required)		SU

Notes: Door status monitored.

Set: 5.0
Description: SGL - CR LOCKSET - CLOSER

Qty	Item	Description	Finish	Mfr
2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 6.0
Description: SGL - RATED - CR LOCKSET - CLOSER

Qty	Item	Description	Finish	Mfr
2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
1	Gasketing	588D (Head & Jambs)		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 7.0
Description: SGL - CR LOCKSET - PS

Qty	Item	Description	Finish	Mfr
2	Hinge, Full Mortise	TA2714	US26D	MK
1	Hinge, Full Mortise [Elec]	TA2714 QCxx	US26D	MK
1	Fail Secure Lock	DG1 RX 8271-24V LNE	US26D	SA
1	Surface Closer w Positive Stop	351 PS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
3	Silencer	As req'd		RO
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential for ingress, free egress at all times. Coordinate with security and electrical.

Set: 8.0
Description: SGL - PRIVACY - CLOSER

Qty	Item	Description	Finish	Mfr
3	Hinge, Full Mortise	TA2714	US26D	MK
1	Privacy Lock w Indicator	V21 8265 LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
1	Gasketing	588D (Head & Jambs)		PE

Set: 9.0
Description: SGL - OFFICE / INDICATOR - PS

Qty	Item	Description	Finish	Mfr
3	Hinge, Full Mortise	TA2714	US26D	MK
1	Entry Lock w Indicator	DG1 V21 8265 LNE	US26D	SA
1	Surface Closer w Positive Stop	351 PS	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Gasketing	588D (Head & Jambs)		PE

Set: 10.0
Description: SGL - CLASSROOM - CLOSER

Qty	Item	Description	Finish	Mfr
3	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	DG1 8237 LNE	US26D	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO

Set: 11.0
Description: SGL - CLASSROOM - CLOSER - COHS

Qty	Item	Description	Finish	Mfr
3	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	DG1 8237 LNE	US26D	SA
1	Concealed Overhead Stop	690S	EN	SA
1	Surface Closer	351 Reg / PA	EN	SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
3	Silencer	As req'd		RO

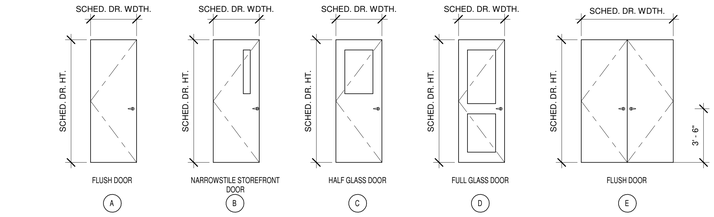
Set: 12.0
Description: SGL - PUSH/PULL PLATE - CLOSER

Qty	Item	Description	Finish	Mfr
3	Hinge (heavy weight)	T4A3786	US26D	MK
1	Pull Plate	BF 110 x 70C	US32D	RO
1	Push Plate	70E	US32D	RO
1	Surface Closer	351 Reg / PA	EN	SA
1	Mop Plate	K1050 4" High x LDW CSK	US32D	RO
1	Kick Plate	K1050 10" High x LDW CSK	US32D	RO
1	Door Stop	406 / 409 / 446 as required	US26D	RO
3	Silencer	As req'd		RO

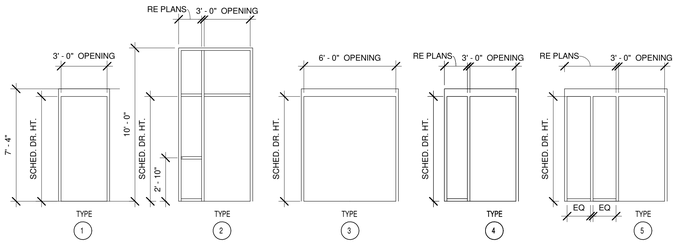
Set: 13.0
Description: CANNOT LOCATE

Qty	Item	Description	Finish	Mfr
1	Cannot Locate	Further Coordination Required		OT

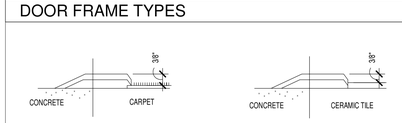
DOOR HARDWARE TYPES 9



DOOR TYPES 1/4" = 1'-0" 4

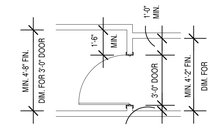


DOOR FRAME TYPES 1/4" = 1'-0" 3



NOTE: PROVIDE SUBSILL WITH END DAMS UNDER EXTERIOR DOOR THRESHOLDS

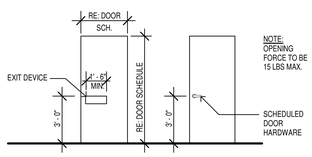
THRESHOLD DETAILS 1/4" = 1'-0" 6



4" WHERE POSSIBLE OR FRAME TIGHT TO WALL WHERE REQD.

TYPICAL JAMB CLEARANCE 2

HEIGHTS



DOOR MOUNTING HEIGHTS 5

20	20 MINUTE RATING	HC	HOLLOW CORE
A	CLASS A (3 HOUR)	HM	HOLLOW METAL
B	CLASS B (1 1/2 HOUR)	LE	LOW-E FLOAT GLASS
C	CLASS C (3/4 HOUR)	LG	LAMINATED GLASS
AL	ALUMINUM	LT	LOW-E TEMP. GLASS
BR	BRONZE	NL	NARROW LITE
CA	CLEAR ANODIZED	PC	POWDER COATED
CB	CEMENT BOARD	PF	PRE-FINISHED
CD	CEDAR	PL	PLASTIC LAMINATE
ED	ELEVATOR DOOR	PT	PAINTED
ET	ETCHED	SP	SPANDREL GLASS
FG	FULL GLAZED	SS	STAINLESS STEEL
FR	FROSTED	ST	STAINED
FT	GLASS - FROSTED & TEMP.	STL	STEEL
GF	GLASS - FLOAT, CLEAR	THR	THRESHOLD
GL	GLASS	WD	WOOD
GR	GLASS - RATED ASSEMBLY	WSTR	WEATHER STRIP
GT	GLASS - TEMPERED, CLEAR	WDHC	WOOD HOLLOW CORE
GSTL	GALVANIZED STEEL	WDSC	WOOD SOLID CORE

DOOR SCHEDULE ABBREVIATIONS

LEGEND 1

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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SEAL:

09/23/2024

FILE:
DRAWN BY: DK
CHECKED BY: MM

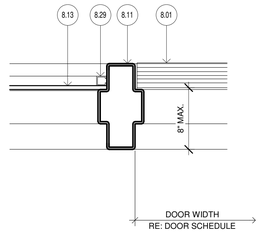
ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

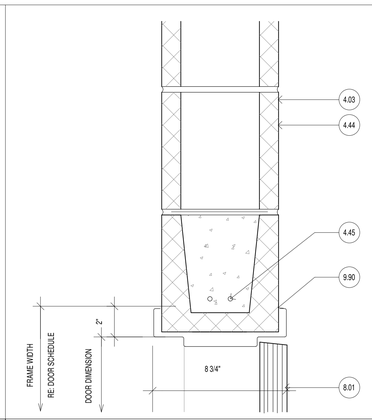
TYPICAL DOOR TYPES, SCHEDULES & HARDWARE TYPES

Scale: AS NOTED

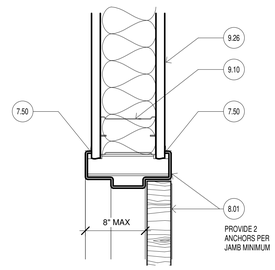
A.820



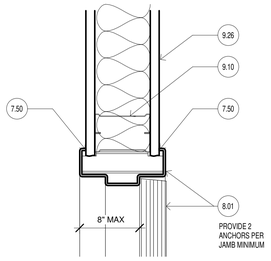
DOOR JAMB - GLAZING 3" = 1'-0" 12



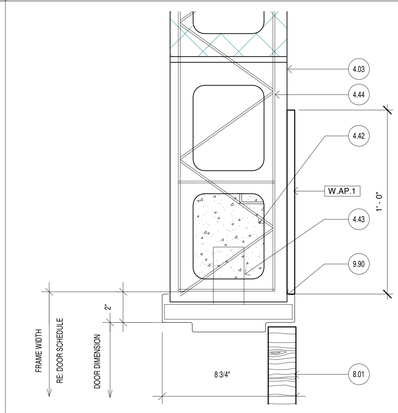
DOOR HEAD - 8" CMU HM 3" = 1'-0" 8



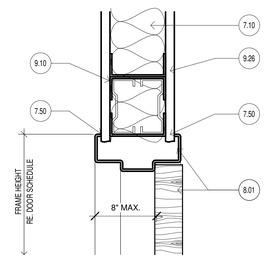
WD DOOR JAMB 3" = 1'-0" 4



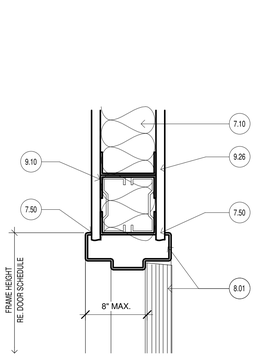
HM DOOR JAMB 3" = 1'-0" 11



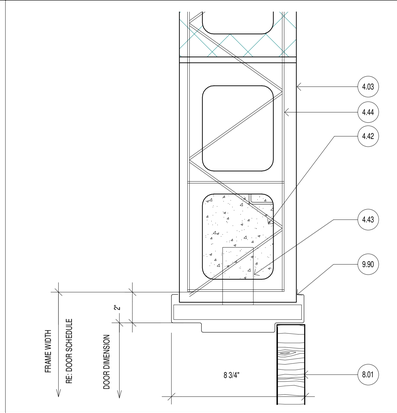
DOOR UNIT JAMB - 8" CMU 3" = 1'-0" 7



WD DOOR HEADER 3" = 1'-0" 3

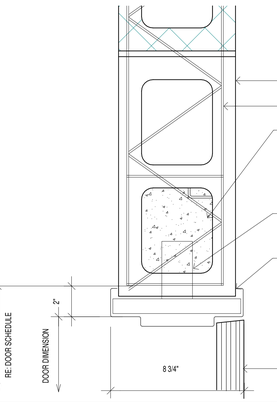


HM DOOR HEADER 3" = 1'-0" 10

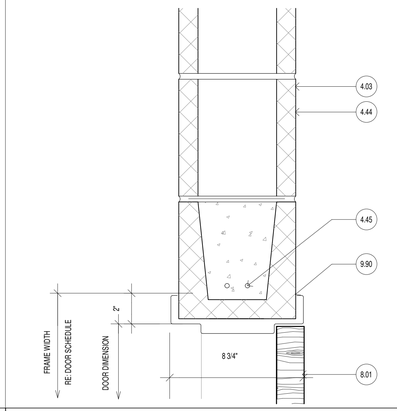


DOOR JAMB - 8" CMU 3" = 1'-0" 6

4.03	8" thick standard running bond CMU, re: Finish schedule
4.42	Fill jamb cells of CMU with masonry grout & provide reinforcing; re: Structural
4.43	Galvanized masonry anchors
4.44	Horizontal masonry reinforcement as specified
4.45	CMU Lintel; re: Structural
7.10	Batt insulation; depth of insulation to match depth of wall stud, unless noted otherwise
7.50	1" cap joint
8.01	Scheduled door; Re: Door schedule
8.11	Scheduled window frame, re: Window Schedule
8.13	Scheduled glazing system, re: Window schedule
8.29	Saddle
9.10	Double studs at jamb conditions, typical
9.26	5/8" gypsum board
9.90	Caulk both sides



DOOR JAMB - 8" CMU HM 3" = 1'-0" 9



DOOR HEAD - 8" CMU 3" = 1'-0" 5

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14292
STATE OF TEXAS

09/23/2024

FILE:
DRAWN BY: Author
CHECKED BY: Checker

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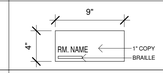
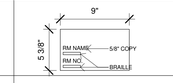
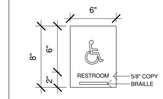
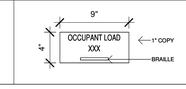
09/23/2024	100% CONSTRUCTION DOCUMENTS

DOOR DETAILS

Scale: AS NOTED

A.821

EXTERIOR SIGNAGE SCHEDULE					
SIGN TYPE	GRAPHICS	COLORS	SIGN NAME AND DESCRIPTION	MOUNTING	LOCATIONS
S1		ACRYLIC BACKGROUND WITH SILKSCREEN WHITE LETTERS AND NUMBERS	ROOM NAME SIGN	48"MIN. AFF, MEASURED FROM THE BASELINE OF THE LOWEST TACTILE CHARACTER AND 60" MAX. AFF, MEASURED FROM THE BASELINE OF THE HIGHEST TACTILE CHARACTER.	FINAL LOCATIONS TO BE APPROVED BY ARCHITECT; RE: DOOR SCHEDULE
S2		ACRYLIC BACKGROUND WITH SILKSCREEN WHITE LETTERS AND NUMBERS	ROOM NAME AND NUMBER SIGN	48"MIN. AFF, MEASURED FROM THE BASELINE OF THE LOWEST TACTILE CHARACTER AND 60" MAX. AFF, MEASURED FROM THE BASELINE OF THE HIGHEST TACTILE CHARACTER.	FINAL LOCATIONS TO BE APPROVED BY ARCHITECT; RE: DOOR SCHEDULE
S3		ACRYLIC BACKGROUND WITH SILKSCREEN WHITE LETTERS AND NUMBERS	RESTROOM HANDICAPPED SIGN: PROVIDE ONE (1) SIGN AT EACH RESTROOM	48"MIN. AFF, MEASURED FROM THE BASELINE OF THE LOWEST TACTILE CHARACTER AND 60" MAX. AFF, MEASURED FROM THE BASELINE OF THE HIGHEST TACTILE CHARACTER.	FINAL LOCATIONS TO BE APPROVED BY ARCHITECT; RE: DOOR SCHEDULE
S4		ACRYLIC BACKGROUND WITH SILKSCREEN WHITE LETTERS AND NUMBERS	OCCUPANT LOAD SIGN	PROVIDE SIGN AT EACH ROOM WITH OCCUPANT LOAD OVER 50. REFER TO CODE REVIEW AND LIFE SAFETY PLANS.	FINAL LOCATIONS TO BE APPROVED BY ARCHITECT; RE: DOOR SCHEDULE

SIGNAGE NOTES:

1. ALL COPY TO BE ARIAL.
2. NO TACTILE CHARACTERS MAY BE LOCATED BELOW 48" AFF
3. SIGN FACE AND BACK SHALL BE ACRYLIC, AS SELECTED BY ARCHITECT. SIDES OF SIGN SHALL MATCH SIGN FACE. COPY IS TO BE SILKSCREEN.
4. PROVIDE BACK COVER PLATE AT GLASS LOCATIONS TO MATCH SIGN FACE.
5. ALL TACTILE CHARACTERS MUST HAVE 3/8" CLEAR ON EACH SIDE AND MEET TAS
6. ROOM NUMBERS AND ROOM NAMES TO BE APPROVED BY OWNER AND ARCHITECT PRIOR TO ORDERING BUILDING SIGNAGE. GC TO COORDINATE SUBMITTAL WITH ARCHITECT.
7. GC TO PROVIDE MAXIMUM OCCUPANCY SIGNS AT ALL ROOMS WITH OCCUPANCY LOAD OVER 50; RE: G.010

SIGNAGE SCHEDULE 1 1/2" = 1'-0" 11

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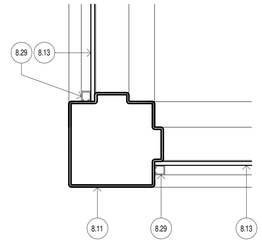
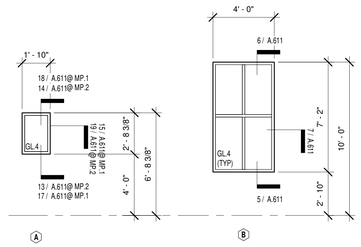
SIGNAGE SCHEDULE

Scale: AS NOTED

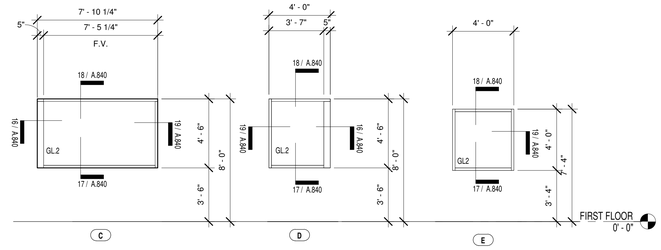
A.830



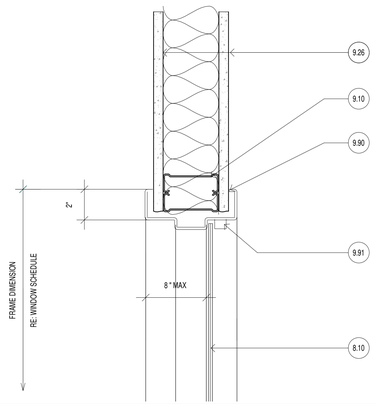
H.M. WINDOW JAMB @ CORNER 3" = 1'-0" 16



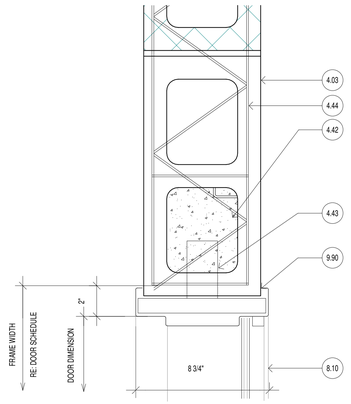
EXTERIOR WINDOW TYPES 12



INTERIOR STOREFRONT ELEVATIONS 4



H.M. WINDOW JAMB 3" = 1'-0" 19



WINDOW JAMB -CMU 3" = 1'-0" 15

EXTERIOR WINDOW SCHEDULE

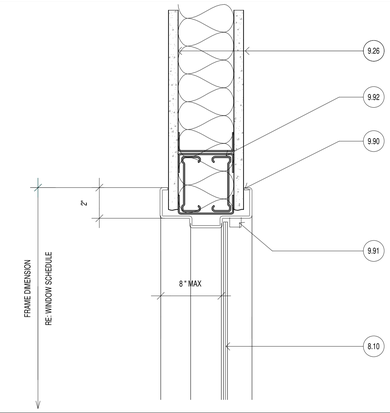
TYPE	WIDTH	HEIGHT	SILL HEIGHT	HEAD HEIGHT	GLAZING TYPE	COMMENTS
A	1' - 10"	2' - 8 3/8"	4' - 0"	6' - 8 3/8"	GL.4	
B	4' - 0"	7' - 2"	2' - 10"	10' - 0"	GL.4	
W	4' - 0"	6' - 0"			-	MECHANICAL LOUVERS, REPLACE EXISTING.

INTERIOR DOOR - WINDOW FRAME NOTE:
INSTALL MANUAL ROLLER SHADES AT ALL INTERIOR WINDOWS AND DOOR-WINDOW FRAMES.

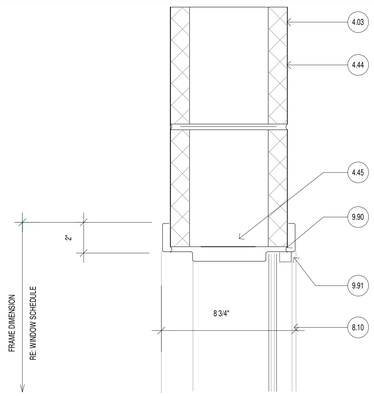
EXTERIOR & INTERIOR GLAZING TYPE SCHEDULE

MARK	THICKNESS	TYPE	SHGC	SHADING COEFF.	U-FACTOR	NOTES
GL1	1"	TEMPERED GLASS - INSULATED LOW EMISSION BLUE-TINT GLASS	.24	.28	.29	PPG STARPHIRE; 1" DOUBLE INSULATED GLAZING SYSTEM (1/4" LOW-E TINTED TEMPERED GLASS, 1/2" AIRSPACE, 1/4" CLEAR TEMPERED GLASS); COLOR TO BE SELECTED BY ARCHITECT.
GL2	1"	CLEAR TEMPERED				INTERIOR GLAZING TYPE
GL3	1"	FROSTED GLASS				INTERIOR GLAZING FOR PRIVACY
GL4	9/16"	LAMINATED TEMPERED GLASS - INSULATED LOW EMISSION GLASS				REPLACEMENT GLASS LITES; LARGE MISSLE IMPACT RESISTANCE

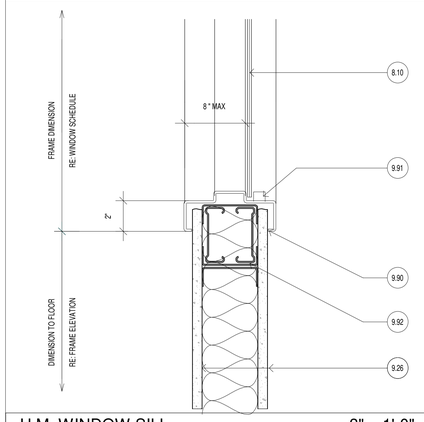
GLAZING & WINDOW SCHEDULES 3



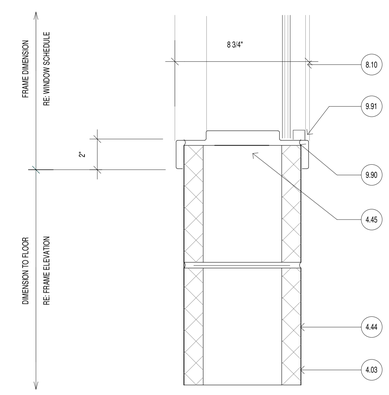
H.M. WINDOW HEADER 3" = 1'-0" 18



WINDOW HEAD - 8" CMU 3" = 1'-0" 14



H.M. WINDOW SILL 3" = 1'-0" 17



WINDOW SILL - 8" CMU 3" = 1'-0" 13

4.03	8" thick standard running bond CMU, re: Finish schedule
4.42	Fill jamb cells of CMU with masonry grout & provide reinforcing; re: Structural
4.43	Galvanized masonry anchors
4.44	Horizontal masonry reinforcement as specified
4.45	CMU Lintel; re: Structural
8.10	Scheduled window, re: Window schedule
8.11	Scheduled window frame, re: Window Schedule
8.13	Scheduled glazing system, re: Window schedule
8.29	Saddle
9.10	Double studs at jamb conditions, typical
9.26	5/8" gypsum board
9.90	Caulk both sides
9.91	Paint applied stops
9.92	Boxed metal stud

1

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09/23/2024

FILE:
DRAWN BY: Author
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ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	100% CONSTRUCTION DOCUMENTS

GLAZING SCHEDULE, FRAME TYPES & INTERIOR GLAZING DETAILS

Scale: AS NOTED

A.840

1. STRUCTURAL CONCEPT, STANDARDS AND LOADS

A. DESIGN CONCEPT:

THE STRUCTURE AS SHOWN HAS BEEN DESIGNED IN ACCORDANCE WITH THE BUILDING CODE REQUIREMENTS AND DESIGN STANDARDS TO SUPPORT THE FINAL BUILDING SERVICE LOADS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADDITIONAL SUPPORTS FOR THE STRUCTURE IF NECESSITATED BY THE CONSTRUCTION SEQUENCE OR METHODS OF FABRICATION, HANDLING, ERECTION, AND OTHER CONSTRUCTION OPERATIONS.

B. BUILDING CODES AND DESIGN STANDARDS:

1. INTERNATIONAL BUILDING CODE, 2021 EDITION.

2. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE): MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, ASCE 7-16, AS AMENDED.

3. AMERICAN CONCRETE INSTITUTE (ACI), BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318, AS AMENDED.

4. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), MANUAL OF STEEL CONSTRUCTION, 360-16, AS AMENDED.

5. AMERICAN WELDING SOCIETY (AWS).

6. STEEL JOIST INSTITUTE (SJI), STANDARD SPECIFICATIONS FOR OPEN WEB STEEL JOISTS AND JOIST GIRDERS.

7. STEEL DECK INSTITUTE (SDI), DESIGN MANUAL FOR COMPOSITE DECKS, FORM DECKS, ROOF DECKS, AND CELLULAR METAL FLOOR DECK WITH ELECTRICAL DISTRIBUTION.

8. AMERICAN IRON AND STEEL INSTITUTE (AISI) "SPECIFICATION FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS", LATEST EDITION.

C. GRAVITY LOADS:

SUPERIMPOSED LOADS ARE GIVEN IN POUNDS PER SQUARE FOOT (PSF).

BUILDING AREA	DEAD LOAD (PSF)	LIVE LOAD (PSF)
1. SLAB ON GRADE	0	100
2. ROOF	20	20

*INCLUDES AN ALLOWANCE OF 15 PSF FOR PARTITION WEIGHT
**EQUIPMENT WEIGHT IF LARGER

D. LATERAL DESIGN LOADS:

1. WIND LOADS FOR AN BASIC DESIGN WIND SPEED OF 148 MPH (ASD WIND SPEED OF 115 MPH), 3-SECOND GUST, WITH EXPOSURE C AND A RISK CATEGORY III (ASCE 7-16 METHOD)

2. COMPONENTS AND CLADDING PRESSURES (PSF) FOR "CLOSED" BUILDINGS:

		ZONE 1		ZONE 2e		ZONE 2n		ZONE 2r		ZONE 3e		ZONE 3r	
ROOF	10 FT²	+28.3	-86.1	+28.3	-86.1	+28.3	-125.6	+28.3	-125.6	+28.3	-125.6	+28.3	-149.3
	100 FT²	+19.0	-26.9	+19.0	-26.9	+19.0	-69.1	+19.0	-69.0	+19.0	-69.1	+19.0	-78.2

		ZONE 4		ZONE 5	
WALLS	10 FT²	+42.6	-46.2	+42.6	-56.9
	100 FT²	+36.4	-39.9	+36.4	-44.3

a. RE: IBC 2021 FOR ADDITIONAL DESCRIPTION OF PRESSURE ZONES.

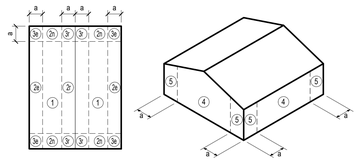
b. POSITIVE PRESSURES ARE PRESSURES ACTING TOWARD THE BUILDING.

c. NEGATIVE PRESSURES ARE PRESSURES ACTING AWAY FROM THE BUILDING.

d. VALUES ABOVE ARE FOR BASIC DESIGN WIND PRESSURES. THE ASD FACTOR 0.6.

e. ZONE WIDTH DIMENSIONS:

Edge distance 'a' (walls & roof) = **9'-9"**



ROOF

WALL

3. WIND-BORNE DEBRIS REGION, USE RISK CATEGORY II WIND SPEED OF 159 MPH BASIC (107.7 MPH ASD)

G. SPECIAL LOADS:

1. STAIR TREADS, RAILING AND GUARDRAILS:

ITEM	REQUIRED CAPACITY
TREADS	300 POUNDS AT CENTER
TOP RAILS	50 PLF HORIZONTALLY
OTHER RAILS, FILLERS & CONNECTIONS	50 PSF HORIZONTALLY
HAND RAILS	200 POUNDS ANY DIRECTION

2. PIPE LOADS WITH WATER:

SIZE	WEIGHT MAX.	SPACING OF HANGERS
4" DIA.	17 PLF	10'-0"
6" DIA.	32 PLF	10'-0"
8" DIA.	50 PLF	10'-0"
10" DIA.	75 PLF	5'-0"
12" DIA.	102 PLF	5'-0"

VALUES ASSUME SCHEDULE 40 STEEL PIPE

A. **WIND STORM CRITERIA:**
1. BUILDING TYPE: INSTITUTIONAL
2. BASIC WIND SPEED:
   A. 148 MPH (EQUIVALENT NOMINAL: 115 MPH)
   B. 3 SECOND GUST
   C. EXPOSURE C
3. COUNTY: JEFFERSON
4. BUILDING CODE: 2021 IBC WITH LOCAL AMENDMENTS IN WHICH THE BUILDING IS BEING PERMITTED
5. IMPACT RESISTANCE: YES
6. SHUTTERS: NO

B. **WIND STORM SUBMITTALS:**
1. DOORS
2. WINDOWS
3. CURTAIN WALL / STOREFRONT
4. TRANSLUCENT WALL / ROOF ASSEMBLIES
5. EXTERIOR COVERING (SIDING, METAL PANELS, EIFS, ETC.)
6. GARAGE DOORS
7. LOUVERS
8. ROOFING
9. ROOF HATCHES
10. SHUTTERS
11. SKYLIGHTS
12. RTU AND RTU CURB ATTACHMENT
13. PEMB CANOPIES

* IMPACT RESISTANCE APPLIES TO EXTERIOR GLAZING IN DOORS, OVERHEAD DOORS, WINDOWS, CURTAINWALL SYSTEMS AND SKYLIGHTS (SMALL MISSLE ABOVE 30'-0" ABOVE GROUND, LARGE MISSLE BELOW 30'-0" ABOVE GROUND)

GC TO SUBMIT SHOP DRAWINGS FOR APPROVAL TO THE WINDSTORM CERTIFICATION ENGINEER PRIOR TO PURCHASING MATERIALS. ANY ITEM NOT MEETING PRE-APPROVED TEXAS DEPARTMENT OF INSURANCE (TDI) CERTIFICATIONS SHALL BE REJECTED. THE ABOVE COMPONENTS SHALL INCLUDE SIGNED AND SEALED SUBMITTALS SHOWING THEY MEET THE WINDSTORM CRITERIA.

2. GENERAL NOTES FOR CONSTRUCTION

A. CONSTRUCTION METHODS, PROCEDURES AND SEQUENCES ARE THE RESPONSIBILITY OF THE CONTRACTOR AND THE CONTRACTOR SHALL TAKE ALL THE NECESSARY MEANS TO MAINTAIN AND PROTECT THE STRUCTURAL INTEGRITY OF ALL CONSTRUCTION AT ALL STAGES.

B. THESE NOTES APPLY TO STRUCTURAL DOCUMENTS SEALED BY THE STRUCTURAL ENGINEER AND ARE INTENDED TO BE COMPLEMENTARY TO AND USED IN CONJUNCTION WITH THE PLANS AND SPECIFICATIONS, INCLUDING THOSE PREPARED BY OTHER DISCIPLINES. CONTRACTOR SHALL REPORT ANY DISCREPANCIES TO THE ARCHITECT/STRUCTURAL ENGINEER IMMEDIATELY. ANY SUCH DISCREPANCIES SHALL BE RESOLVED TO THE MORE STRINGENT REQUIREMENTS, UNLESS OTHERWISE AUTHORIZED BY THE STRUCTURAL ENGINEER.

C. ANY DISCREPANCIES ON THE STRUCTURAL DOCUMENTS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ARCHITECT/STRUCTURAL ENGINEER PRIOR TO SUBMISSION OF BIDS OR PROPOSALS, OR IF NOT REASONABLE DISCERNABLE DURING PREPARATION OF BIDS AND PROPOSALS, BEFORE COMMENCING THE WORK IN QUESTIONS. NO FIELD CHANGES OR DEVIATIONS FROM THE DESIGN ARE TO BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE ARCHITECT AND/OR STRUCTURAL ENGINEER. NO CHANGE ORDER CONSIDERATION WILL BE GIVEN TO CHANGES FOR WHICH THE ARCHITECT AND/OR ENGINEER WERE NOT CONTACTED PRIOR TO CONSTRUCTION OF THE AFFECTED ITEM.

D. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONSTRUCTION, INCLUDING EXISTING WORK, PRIOR TO COMMENCING WORK. ANY DISCREPANCIES SHALL BE REPORT IMMEDIATELY TO THE ARCHITECT/STRUCTURAL ENGINEER.

E. ALL PROPOSED SUBSTITUTIONS MUST BE EQUAL OR BETTER AND SHALL BE REVIEWED BY THE ARCHITECT/ENGINEER PRIOR TO ANY PERTINENT WORK AND PRIOR TO THE AWARD OF THE CONTRACT.

F. NOT ALL OPENINGS AND OTHER COMPONENTS THAT ARE REQUIRED HAVE BEEN SHOWN IN THE STRUCTURAL DRAWINGS. COORDINATE WITH THE ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND VERIFY THE LOCATIONS AND SIZES OF ALL CHASES, INSERTS, OPENINGS, SLEEVES, FINISHES, DEPRESSIONS, PADS AND OTHER PROJECT REQUIREMENTS. FLOOR PLAN WILL BE FURNISHED FOR THAT PURPOSE.

G. THE CONTRACTOR IS RESPONSIBLE FOR REVIEWING THE MECHANICAL, ELECTRICAL, PLUMBING AND ARCHITECTURAL DRAWINGS TO DETERMINE WHERE OPENINGS ARE REQUIRED IN REINFORCED CONCRETE BEAMS, SLABS AND WALLS.

H. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, DETAILING ALL THE OPENINGS, INCLUDING ADDED REINFORCEMENT AS SHOWN ON THE TYPICAL WALL, SLAB AND BEAM OPENING DETAILS FOR REVIEW.

I. ADDITIONAL REINFORCEMENT ABOVE THAT SHOWN IN THE TYPICAL SLAB AND BEAM OPENING DETAILS MAY BE REQUIRED AND WILL BE REVIEWED ON THE SHOP DRAWINGS.

J. USE THE MANUFACTURER'S CERTIFIED DRAWINGS AND SPECIFICATIONS FOR THE EQUIPMENT ANCHORAGE AND DETAILS.

K. ALL CONSTRUCTION JOINTS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE INCORPORATED INTO THE STRUCTURE. ADDITIONAL CONSTRUCTION JOINTS TO FACILITATE CONSTRUCTION SHALL BE LOCATED AND DETAILED ON THE SHOP DRAWINGS FOR REVIEW.

L. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED IN BEAMS UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.

M. ALL CONSTRUCTION AND CONTROL JOINTS FOR BEAMS WHICH ARE EXPOSED TO VIEW ARE TO BE LOCATED TO COINCIDE WITH THE ARCHITECTURAL RUSTICATION JOINTS AS SHOWN ON THE BUILDING ELEVATION SHEETS OR AS REVIEWED IN WRITING.

N. SHOP DRAWINGS

1. THE TERM "SHOP DRAWINGS" INCLUDES FABRICATION, MANUFACTURING, ERECTION AND SETTING DRAWINGS, BROCHURES, CERTIFICATES, AND PRODUCT DATA DESCRIBING MATERIALS AND EQUIPMENT. SHOP DRAWINGS SHALL INCLUDE ALL PERTINENT INFORMATION REQUIRED FOR THE ENGINEER TO FULLY EVALUATE THE MATERIALS BEING REPRESENTED BY THE SUBMITTAL INCLUDING THE PHYSICAL PROPERTIES, DIMENSIONS, LOCATIONS AND METHOD OF INSTALLATION.

2. SHOP DRAWINGS WILL BEAR THE REVIEW STAMP OF THE CONTRACTOR INDICATING THAT HE HAS REVIEWED THE DRAWINGS FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS; COORDINATED ITEMS INCLUDED IN THE SUBMITTAL WITH RELATED ITEMS; AND VERIFIED AND COORDINATED DIMENSIONS.

3. REPRODUCTIONS OF THE ENGINEERING DRAWINGS WILL NOT BE ACCEPTABLE AS SHOP DRAWINGS.

4. ANY SHOP DRAWING NOT CONFORMING TO THESE REQUIREMENTS WILL BE CAUSE FOR REJECTION AND WILL BE RETURNED WITHOUT ANY FURTHER ACTION.

5. STRUCTURAL SUBMITTALS REQUIRED FOR APPROVAL INCLUDE, BUT ARE NOT LIMITED TO:

CONCRETE ACCESSORIES (MANUFACTURERS PRODUCT DATA)
STEEL REINFORCING
CONCRETE MIX DESIGN
CONTROL JOINT LAYOUT
CONCRETE MATERIAL CERTIFICATES
STRUCTURAL STEEL FRAMING
STRUCTURAL STEEL CONNECTION CALCULATIONS
STEEL ROOF DECK
COLD FORMED METAL FRAMING
COLD FORMED METAL FRAMING CALCULATIONS
MISC. STEEL FABRICATIONS

6. DELEGATED STRUCTURAL DESIGN OF COMPONENTS:

A. SEE APPLICABLE SECTIONS OF GENERAL NOTES FOR THE APPROPRIATE DESIGN RESPONSIBILITIES OF THE SUPPLIER AND IT'S LICENSED ENGINEER

3. DEMOLITION

A. CONDUCT DEMOLITION OPERATIONS IN EXTREMELY CAREFUL MANNER IN ORDER TO PREVENT ANY DAMAGES TO ALL EXISTING CONSTRUCTION AND TO MINIMIZE INTERFERENCE WITH ADJACENT **STRUCTURES**

B. PREVENT THE MOVEMENT, SETTLEMENT, DAMAGE OR INJURY TO ADJACENT STRUCTURES, PROVIDE & PLACE BRACING OR SHORING & BE RESPONSIBLE FOR THE SAFETY AND SUPPORT OF THE ADJACENT STRUCTURES, ASSUME FULL LIABILITY FOR SUCH MOVEMENT, SETTLEMENT, DAMAGE, OR INJURY.

C. CEASE OPERATIONS & NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY IF SAFETY ADJACENT STRUCTURES APPEARS TO BE ENDANGERED. TAKE PRECAUTIONS TO SUPPORT EXISTING STRUCTURES PROPERLY. DO NOT RESUME OPERATIONS UNTIL THE FULL SAFETY IS RESTORED.

D. PREVENT MOVEMENT, SETTLEMENT OR COLLAPSE OF ADJACENT SERVICES, SIDEWALKS, DRIVEWAYS & TREES. ASSUME FULL LIABILITY FOR SUCH MOVEMENT, SETTLEMENT OR COLLAPSE. REPAIR DAMAGE PROMPTLY AT NO COST TO THE OWNER.

E. DEMOLISH INDICATED STRUCTURES & APPURTENANCE IN AN ORDERLY AND CAREFUL MANNER.

F. PERFORM DEMOLITION IN ACCORDANCE WITH THE APPLICABLE AUTHORITIES HAVING JURISDICTION.

G. REMOVE FOUNDATION WALLS & FOOTINGS AS INDICATED ON DEMOLITION DRAWINGS TO A MINIMUM 3' FEET BELOW FINISH GRADE.

H. REPAIR ANY DEMOLITION PERFORMED IN EXCESS OF THAT INDICATED, AT NO COST TO THE OWNER OR THE ARCHITECT/ENGINEER.

I. REPAIR DAMAGE TO ADJACENT STRUCTURES CAUSED AS THE RESULT OF THIS WORK AT NO COST TO THE OWNER OF THE ARCHITECT/ENGINEER.

4. SHORING REQUIREMENTS

A. DESIGN, CONSTRUCT AND MAINTAIN TEMPORARY SHORING AND BRACING TO SAFELY SUPPORT THE EXISTING WALLS, FLOOR SLABS AND ROOF WHERE NEW OPENINGS ARE TO BE CUT INTO THE EXISTING WHERE LOAD-BEARING ELEMENTS ARE TO BE REMOVED.

B. SUBMIT CALCULATIONS, SHORING PROCEDURES AND DETAILS PREPARED, AND SEALED, BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF TEXAS, TO THE ARCHITECT FOR REVIEW PRIOR TO PRECEDING WITH THIS WORK.

C. SHORING AND BRACING WORK SHALL BE PERFORMED BY A SHORING CONTRACTOR WITH A MINIMUM OF FIVE YEARS EXPERIENCE IN SIMILAR TYPE OF WORK.

D. PRIOR TO START OF WORK, ESTABLISH AND DOCUMENT ELEVATIONS OF THE EXITING CONSTRUCTION AT INTERVALS ALONG THE WALLS TO BE REMOVED. CONTINUOUSLY MONITOR THE ELEVATION DURING DEMOLITION AND CONSTRUCTION OPERATIONS. METHOD OF SHORING SHOULD HAVE PROVISIONS FOR VERTICAL ADJUSTMENT TO MAINTAIN ELEVATIONS OF EXISTING CONSTRUCTION.

5. CONCRETE

A. CONCRETE SCHEDULE:

BUILDING COMPONENT	28 DAY CYLINDER COMPRESSIVE STRENGTH POUNDS PER SQUARE INCH(PSI)					
	NORMAL WEIGHT			MAX AGGREGATE SIZE (IN)	SLUMP (IN)	W/C RATIO
	3000	3500	4000			
1. DRILLED PIERS	●			1 1/2"	5-7	0.55
2. SLAB-ON-GRADE		●		1"	4-6	0.50
3. GRADE BEAMS AND PLINTHS		●		1"	4-6	0.50
4. ALL OTHER CONCRETE	●			1"	4-6	0.52

B. PROVIDE DEFORMED NEW BILLET STEEL BARS CONFORMING TO ASTM A615, GRADE 60. ALL REINFORCING STEEL SHALL BE SECURELY HELD IN PLACE; PROVIDE ADDITIONAL BARS OR STIRRUPS FOR SUPPORT AS REQUIRED.

C. WELDED WIRE FABRIC SHALL CONSIST OF FLAT SHEETS AND SHALL CONFORM TO ASTM A185, WITH A MINIMUM YIELD STRENGTH OF 65.0 KSI

D. PROVIDE FULL EMBEDMENT WITH STANDARD 90 DEGREE HOOKS FOR ALL DOWELS. IF NOT OTHERWISE SPECIFIED, THE DOWEL SIZE AND SPACING SHALL BE THE SAME AS THE MAIN REINFORCING.

E. WHEN REINFORCING STEEL IN GRADE BEAMS, WALLS, SLABS AND BEAMS, IS NOTED AS CONTINUOUS, SPLICE REINFORCING STEEL ONLY WHEN UNAVOIDABLE DUE TO STOCK LENGTHS. STAGGER ALL SPLICES A MINIMUM OF 4'-0". ADJACENT BAR SPLICES ARE NOT ACCEPTABLE.
LOCATE THE TOP BAR SPLICES WITHIN THE MIDDLE HALF OF THE SPAN AND LOCATE THE BOTTOM BAR SPLICES AT SUPPORTS OR BETWEEN SUPPORTS AND 1/3 SPAN POINT, UNLESS NOTED OTHERWISE ON PLANS, DETAILS OR SCHEDULES.

F. PROVIDE INTERIOR AND EXTERIOR HORIZONTAL LAPPED CORNER BARS AT ALL CORNERS TO MATCH THE SIZE, TYPE AND SPACING OF THE WALL AND GRADE BEAM HORIZONTAL REINFORCING.

G. UNLESS SPECIFICALLY NOTED, SCHEDULED OR DETAILED OTHERWISE, PROVIDE DEVELOPMENT LENGTH FOR REINFORCING IN CONCRETE COMPONENTS IN ACCORDANCE WITH THE SCHEDULE IN NOTE H. BELOW. THIS SCHEDULE SHALL APPLY TO ALL DEVELOPMENT LENGTHS NOT OTHERWISE NOTED, DETAILED OR SCHEDULED IN THE DRAWINGS OR SPECIFICATIONS.

H. REINFORCING BAR DEVELOPMENT LENGTHS (Ld) IN INCHES FOR VARIOUS CONCRETE STRENGTHS IN POUNDS PER SQUARE INCH (PSI). TOP BARS ARE DEFINED AS HORIZONTAL REINFORCING SO PLACED IN A MEMBER THAT MORE THAN 12 INCHES OF CONCRETE IS CAST BELOW THE BAR. ALL OTHER CONDITIONS ARE CONSIDERED BOTTOM BARS FOR DEVELOPMENT AND SPLICE LENGTH PURPOSES.

BAR SIZE GRADE 60	Ld FOR TOP BARS				Ld FOR BOTTOM BARS			
	28 DAY CYLINDER CONCRETE STRENGTH (PSI)				28 DAY CYLINDER CONCRETE STRENGTH (PSI)			
	3000/3500	4000	5000	6000	3000/3500	4000	5000	6000
#3	22	19	17	16	17	15	13	12
#4	29	25	23	21	22	19	17	16
#5	36	31	28	26	28	24	22	20
#6	43	37	34	31	33	29	26	24
#7	63	54	49	45	48	42	38	34
#8	72	62	56	51	55	48	43	39
#9	81	70	62	57	62	54	48	44
#10	89	78	69	63	69	60	53	49
#11	98	85	76	70	76	66	59	54

1. WHEN TWO BARS OF DIFFERENT SIZES ARE LAPPED, THE SMALLER SIZE SHALL GOVERN THE LAP LENGTH UNLESS SPECIFICALLY NOTED.

2. WELDED OR MECHANICAL SPLICES CAPABLE OF DEVELOPING 125% OF THE BAR YIELD STRENGTH MAY BE USED IN LIEU OF THE LAPS. SUCH SPLICES MAY BE EITHER FULL BUTT WELDS OR SERIES "C CADWELDS OR EQUAL."

J. AT LAP SPLICES, PROVIDE LAP SPLICE LENGTHS FOR REINFORCING BARS 1.3 TIMES THE Ld SHOWN IN TABLE IN NOTE H ABOVE.

K. THE GENERAL NOTES, LAP LENGTHS OR DETAILS PERTAINING TO REINFORCING STEEL AS SHOWN ON THE DETAIL SHEETS OR OTHER SCHEDULES SHALL SUPERSEDE THE NOTES SHOWN ON THIS SHEET.

L. PROVIDE THE FOLLOWING COVER FOR CAST-IN-PLACE CONCRETE REINFORCING.

1. UNFORMED SURFACES IN CONTACT WITH EARTH: 3 INCHES

2. UNFORMED SURFACES OVER MOISTURE BARRIER: 2 INCHES

3. FORMED SURFACES EXPOSED TO EARTH OR WEATHER

a. #6 AND LARGER: 2 INCHES
b. #5 AND SMALLER: 1 1/2" INCHES

4. FORMED SURFACES NOT EXPOSED TO EARTH OR WEATHER
a. SLABS AND WALLS: 3/4 INCHES
b. BEAMS AND COLUMNS 1 1/2 INCHES

6. COLD-FORMED METAL FRAMING:

A. PROVIDE COLD-FORMED METAL FRAMING, INCLUDING TRUSSES, STUDS, JOIST, TRACK, RUNNERS, LINTELS, CLIP ANGLES, REINFORCEMENTS, SHOES, BLOCKING, AND BRIDGING, COMPLETE WITH ALL FASTENERS, AND ACCESSORIES NEEDED FOR A COMPLETE AND FINISHED INSTALLATION.

B. THE STRUCTURAL DRAWINGS INDICATE THE GENERAL CONFIGURATION OF FRAMING FOR TYPICAL CONDITIONS ONLY. FINAL CONFIGURATION OF DETAILS AS WELL AS ALL SUPPLEMENTARY FRAMING TO OBTAIN THE ROOF PROFILES SHOWN ON THE PLANS SHALL BE AS DETERMINED BY DESIGN.

C. COLD-FORMED METAL FRAMING SHALL BE DESIGNED IN ACCORDANCE WITH AMERICAN IRON AND STEEL INSTITUTE (AISI) PUBLICATION: "SPECIFICATION FOR DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" LATEST EDITION. PROVIDE STEEL FOR RAFTERS, JOISTS, STUDS AND ACCESSORIES CONFORMING TO ASTM A1003, GRADE 50, STRUCTURAL QUALITY STEEL SHEET FORMED TO 'C' SHAPES, UNPUNCHED WITH STIFFENED FLANGES.

D. ALL STRUCTURAL MEMBERS SHALL BE FORMED FROM CORROSION-RESISTANT STEEL, CORRESPONDING TO THE REQUIREMENTS OF ASTM A446, GRADE C, WITH A MINIMUM YIELD STRENGTH OF 50 KSI FOR STUDS AND JOISTS AND GRADE A, 33KSI, FOR RUNNERS. ALL STRUCTURAL MEMBERS SHALL BE ZINC COATED MEETING ASTM A525, G-60, OR EQUIVALENT. TYPICAL.

E. FASTENING OF COMPONENTS SHALL BE WITH SELF-DRILLING SCREWS OR BY WELDING. SCREWS AND WELDS SHALL BE OF SUFFICIENT SIZE TO ENSURE THE STRENGTH OF THE CONNECTION. ALL WELDS SHALL BE TOUCHED-UP WITH A ZINC-RICH PAINT.

F. SUBMIT SHOP DRAWINGS FOR ALL FRAMING PREPARED UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL ENGINEER, AND CALCULATIONS, SIGNED AND SEALED BY SAID ENGINEER, FOR REVIEW PRIOR TO ERECTION OF ANY COLD-FORMED METAL FRAMING.

SHOP DRAWINGS SUBMITTED FOR REVIEW SHALL CONTAIN THE FOLLOWING FOR EACH:

A. COMPLETE ERECTION DRAWINGS SHOWING LOCATION AND SPACING OF ALL FRAMING MEMBERS.
B. SIZE AND GAGE OF ALL FRAMING MEMBERS.
C. DETAIL DRAWINGS OF ALL PREFABRICATED ASSEMBLIES.
D. LOADING CONDITIONS USED IN DESIGN.
E. CALCULATED FORCES FOR ALL MEMBERS.
F. ANCHORAGE DETAILS, CONNECTION DETAILS, SLICE DETAILS, TEMPORARY AND PERMANENT BRACING.

G. TEMPORARY BRACING, WHERE REQUIRED, SHALL BE PROVIDED UNTIL ERECTION IS COMPLETE.

H. THE INFORMATION PROVIDED SHALL TAKE INTO ACCOUNT AND SHOW ALL SPECIAL DESIGN, FRAMING AND CONNECTION REQUIREMENTS SUCH AS AT CONCENTRATED LOADS, UNBALANCED OR UNSYMMETRICAL LOAD CONDITIONS, AND OTHER NON-TYPICAL FRAMING DETAILS.

I. SPLICES IN FRAMING COMPONENTS, OTHER THAN RUNNER TRACK, SHALL NOT BE PERMITTED.

J. BLOCKING SHALL BE PROVIDED AT SUPPORTS WHERE JOISTS ARE NOT OTHERWISE RESTRAINED FROM ROTATION.

K. ABUTTING LENGTHS OF RUNNER TRACK SHALL BE BUTT-WELDED, SPLICED OR EACH LENGTH SECURELY ANCHORED TO A COMMON STRUCTURAL ELEMENT. RUNNER TRACK SHALL BE SECURELY ANCHORED TO THE SUPPORTING STRUCTURE.

L. PROVIDE MEMBERS WITH THE FOLLOWING MINIMUM SECTION PROPERTIES:

SECTION	MINIMUM THICKNESS	Ix (MOMENT OF INERTIA)	Sx (SECTION MODULUS)	FY (YIELD STRENGTH)
6" TYPICAL JOISTS, RAFTERS	0.056 INCHES	2.83 INCHES ^{4}	0.95 INCHES ^{3}	50 KSI
6" EXTERIOR STUDS	0.056 INCHES	2.31 INCHES ^{4}	0.95 INCHES ^{3}	50 KSI
3 5/8" INTERIOR STUDS	0.045 INCHES	0.71 INCHES ^{4}	0.39 INCHES ^{3}	33 KSI
RUNNER TRACK	0.045 INCHES	2.49 INCHES ^{4}	0.81 INCHES ^{3}	33 KSI

M. MEMBER PERFORMANCE:

1. RAFTERS AND HEADERS: VERTICAL DEFLECTION IS LIMITED TO 1/240 OF THE SPAN.

2. STUDS: HORIZONTAL DEFLECTION IS LIMITED TO 1/240 OF THE SPAN (TYPICAL); FOR BRICK VENEER 1/600 OF THE SPAN.

SHEET LIST	
Sheet Number	Sheet Name
S101	GENERAL STRUCTURAL CRITERIA
S201	DEMO PLAN
S202	FOUNDATION PLAN
S301	TYPICAL SITE FOUNDATION DETAILS

JC DIVERSION CENTER RENOVATION

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FRED DALLY
90904
LICENSED
STATE OF TEXAS
ENGINEER

09/23/2024

FILE:
DRAWN BY: AUH
CHECKED BY: LM

ISSUE:

1	08-23-2024	90% CONSTRUCTION DOCUMENTS
2	09-23-2024	ISSUE FOR BID & PERMIT

GENERAL STRUCTURAL CRITERIA

Scale: AS NOTED

S101

EXISTING CONDITIONS NOTES TO G.C.:

1. ALL EXISTING DIMENSIONS, ELEVATIONS, AND CONDITIONS SHALL BE FIELD VERIFIED PRIOR TO PREPARING THE SHOP DRAWINGS AND START OF CONSTRUCTION.

2. THE GENERAL CONTRACTOR SHALL VERIFY THE LOCATION AND SIZE OF ALL STRUCTURAL MEMBERS PRIOR TO BEGINNING ANY DEMOLITION.

3. DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND THE ENGINEER OF RECORD IF MODIFICATIONS TO THE DESIGN ARE REQUIRED DUE TO FIELD VERIFIED DIMENSIONS AND CONDITIONS.

4. THE STRUCTURAL ENGINEER OF RECORD IS NOT RESPONSIBLE FOR THE DESIGN OF ANY TEMPORARY SHORING OR BRACING REQUIRED BETWEEN DEMOLITION AND THE INSTALLATION OF THE NEW STRUCTURE.

5. ONLY CMU PARTITIONS TO BE DEMOLISHED ARE NOTED ON STRUCTURAL DEMOLITION PLANS. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL PARTITIONS NOT SHOWN THAT REQUIRE DEMOLITION. COORDINATE EXTENTS WITH ARCH PRIOR TO CONSTRUCTION.

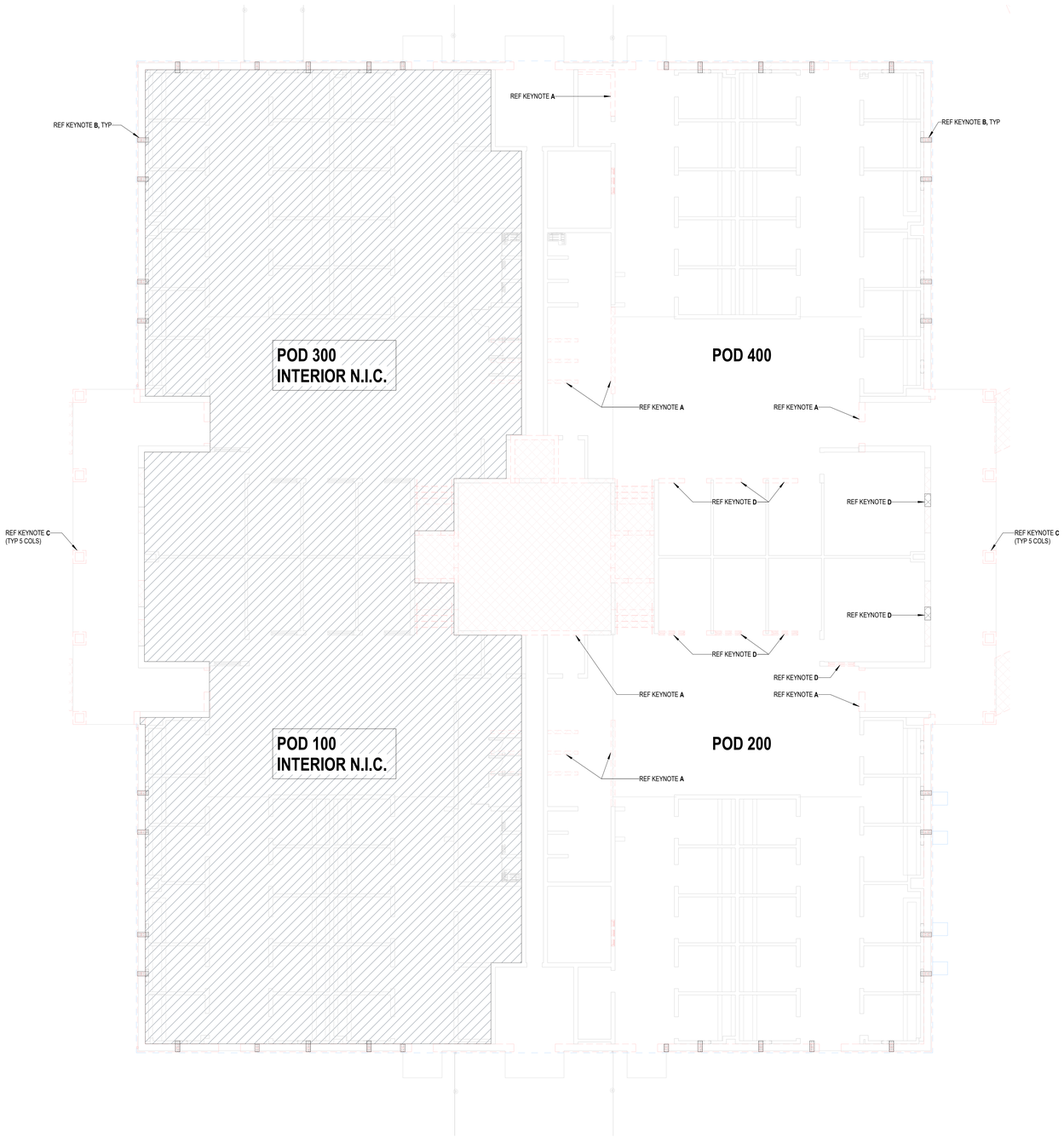
DEMO KEYNOTES

A. EXISTING CMU WALLS TO BE DEMOLISHED. GC TO SHORE ANY CEILING OR MEZZANINE FRAMING UNTIL ALL NEW HEADERS OR NEW WALLS ARE INSTALLED. ANY REBAR DOWELS COMING OUT OF FOUNDATION SHALL BE GRINDED SMOOTH LEVEL WITH EXISTING FLOOR.

B. SAW CUT EXISTING CMU WALL TO WIDEN EXISTING WINDOW TO 2'-0" WIDE. RELOCATE EXISTING PEMB WINDOW JAMB TO ALLOW FOR 2'-0" WIDE WINDOW. USE SAME CONNECTION CLIPS AND DRILL NEW HOLES INTO EXISTING WALL GIRT AT RELOCATED JAMB LOCATION. SEE ARCHITECTURAL DRAWINGS FOR WINDOW DIMENSIONS.

C. REMOVE BRICK COVER BUT KEEP STRUCTURE IN PLACE (TYP).

D. PARTIAL CMU WALL TO BE DEMOLISHED TO INSTALL NEW WINDOW. GC TO SHORE ANY CEILING OR MEZZANINE FRAMING UNTIL ALL NEW HEADERS OR NEW WALLS ARE INSTALLED. ANY REBAR DOWELS COMING OUT OF FOUNDATION SHALL BE GRINDED SMOOTH LEVEL WITH EXISTING FLOOR



1 DEMO PLAN
1/8" = 1'-0"

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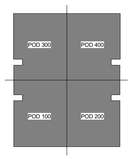
KEYPLAN:



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ISSUE:

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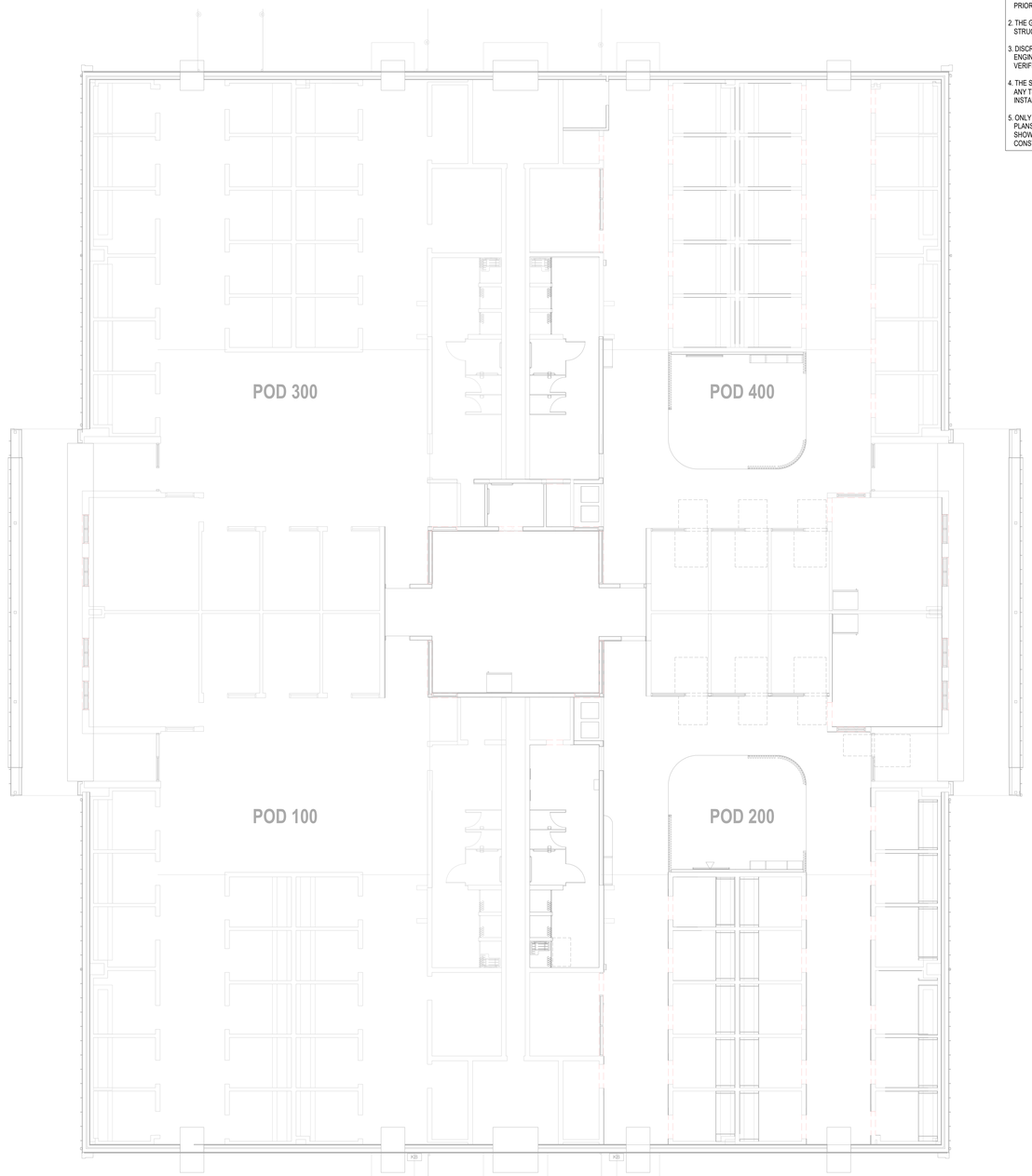
DEMO PLAN

Scale: AS NOTED

S201

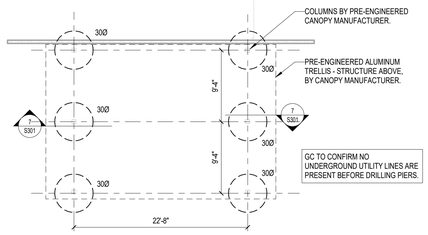


EXISTING CONDITIONS NOTES TO G.C.:

1. ALL EXISTING DIMENSIONS, ELEVATIONS, AND CONDITIONS SHALL BE FIELD VERIFIED PRIOR TO PREPARING THE SHOP DRAWINGS AND START OF CONSTRUCTION.
2. THE GENERAL CONTRACTOR SHALL VERIFY THE LOCATION AND SIZE OF ALL STRUCTURAL MEMBERS PRIOR TO BEGINNING ANY DEMOLITION.
3. DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND THE ENGINEER OF RECORD IF MODIFICATIONS TO THE DESIGN ARE REQUIRED DUE TO FIELD VERIFIED DIMENSIONS AND CONDITIONS.
4. THE STRUCTURAL ENGINEER OF RECORD IS NOT RESPONSIBLE FOR THE DESIGN OF ANY TEMPORARY SHORING OR BRACING REQUIRED BETWEEN DEMOLITION AND THE INSTALLATION OF THE NEW STRUCTURE.
5. ONLY CMU PARTITIONS TO BE DEMOLISHED ARE NOTED ON STRUCTURAL DEMOLITION PLANS. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL PARTITIONS NOT SHOWN THAT REQUIRE DEMOLITION. COORDINATE EXTENTS WITH ARCH PRIOR TO CONSTRUCTION.

FOUNDATION NOTES:

1. DATUM ELEVATION <0'-0"> CORRESPONDS TO TRUE ELEVATION = RE: CIVIL. ALL ELEVATIONS ARE RELATIVE TO DATUM ELEVATION <0' - 0">.
2. TYPICAL LIGHT POLE FOUNDATION DETAIL RE: 1/S301.
3. VERIFY ALL SLOPES, DEPRESSIONS, ELEVATIONS WITH ARCH. PRIOR TO CONSTRUCTION
4. G.C. TO PROVIDE A HOUSEKEEPING PAD UNDER ALL MECHANICAL UNITS. FOR TYPCIAL HOUSEKEEPING PAD DETAIL RE: 3/S301.



1 FOUNDATION PLAN
1/8" = 1'-0"

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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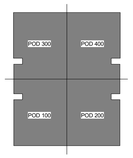
KEYPLAN:



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FILE:
DRAWN BY: AUH
CHECKED BY: LM

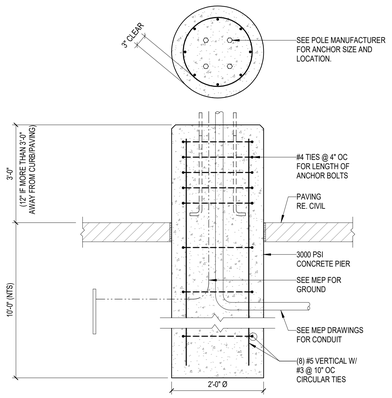
ISSUE:

1	08-23-2024	90% CONSTRUCTION DOCUMENTS
2	09-23-2024	ISSUE FOR BID & PERMIT

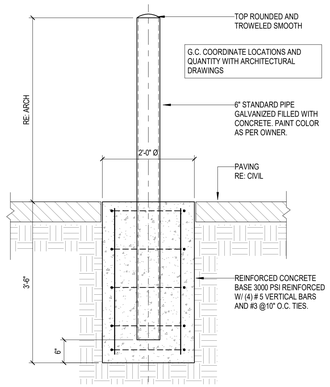
FOUNDATION PLAN

Scale: AS NOTED

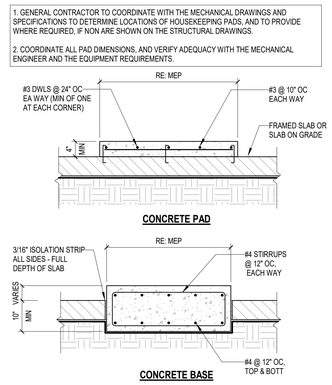
S202



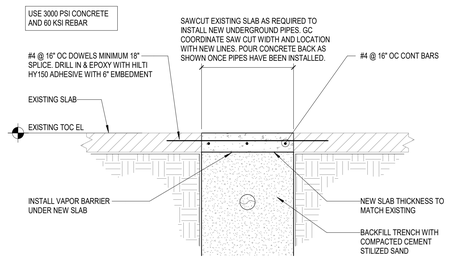
1 TYPICAL LIGHT POLE DETAIL (30'-0" TALL MAX)
3/4" = 1'-0"



2 TYPICAL BOLLARD DETAIL
3/4" = 1'-0"



3 TYPICAL PAD BASE DETAIL
3/4" = 1'-0"



4 SLAB POUR-BACK DETAIL
3/4" = 1'-0"

5 MONUMENT SIGN - PLAN
3/4" = 1'-0"

6 MONUMENT SIGN
3/4" = 1'-0"

7 TYPICAL SECTION @ CANOPY COLUMN & PIER
3/4" = 1'-0"

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TYPICAL SITE FOUNDATION DETAILS

Scale: AS NOTED

S301

DUCTWORK SYMBOLS

SINGLE	DOUBLE	ABBR.	DESCRIPTION
		-	RECTANGULAR DUCT (NEW)
		-	ROUND DUCT (NEW)
		-	RECTANGULAR DUCT (EXISTING)
		-	ROUND DUCT (EXISTING)
		-	45 DEG TAP: USE AT BRANCH DUCTS ONLY
		-	DUCT SPLIT WITH DAMPER: USE AT ELBOWS AND TEES: PROPORTION DUCT AREAS BY CFMS
		-	CURVED ELBOW MIN. RADIUS R:1.5 WIDTH
		-	90 DEG ELBOW WITH SINGLE RADIUS TURNING VANES
		-	FLEXIBLE DUCT CONNECTION
SD	SD	SD	SMOKE DETECTOR
		VD	VOLUME DAMPER
		-	SPIN-IN FLEX DUCT TAKEOFF WITH DAMPER
		SA	SUPPLY AIR
		EXH/EA	EXHAUST AIR
		RA	RETURN AIR
		REL	RELIEF AIR
		OSA/OA	OUTSIDE AIR
		POC	POINT OF CONNECTION
-	-	TA	TRANSFER AIR
-	-	FF	FINISHED FLOOR
-	-	AFF	ABOVE FINISHED FLOOR
-	-	BFF	BELOW FINISHED FLOOR
-	-	NTS	NOT TO SCALE
		FSD	FIRE/SMOKE DAMPER
S	S	S	SENSOR
F	F	-	FIRE STAT SET AT 165 DEG F
O	O	-	OUTSIDE AIR STAT
T	T	T	THERMOSTAT MOUNTED AT A MIN. 48" - 54" A.F.F.
CO	CO	-	CO2 SENSOR
H	H	-	HUMIDISTAT
U.C.	U.C.	U.C.	UNDERCUT DOOR 1". COORDINATE WITH GENERAL CONTRACTOR

NOTE: ALL SYMBOLS MAY NOT APPLY

HVAC PIPING LEGEND

SYMBOL	ABBR.	DESCRIPTION
CHWS	CHWS	CHILLED WATER SUPPLY PIPING
CHWR	CHWR	CHILLED WATER RETURN PIPING
CWS	CWS	CONDENSER WATER SUPPLY PIPING
CWR	CWR	CONDENSER WATER RETURN PIPING
HWS	HWS	HEATING WATER SUPPLY PIPING
HWR	HWR	HEATING WATER RETURN PIPING
	CW	COLD WATER PIPING
	HW	HOT WATER PIPING
	HWR	HOT WATER RETURN PIPING
G	G	NATURAL GAS PIPING
FW	FW	FILTERED WATER PIPING
D	D/CD	INDIRECT OR CONDENSATE DRAIN
	-	ISOMETRIC CONTINUATION
	-	PIPE RISE
	-	PIPE DROP
	-	PIPE DROP UNDER A HORIZONTAL PIPE
	-	PIPE CAP
	-	PIPE BREAK
	GV	GATE VALVE
	GBV	GLOBE VALVE
	BV	BALL VALVE
	CV	CHECK VALVE
	PV	PLUG VALVE
S	SV	SOLENOID VALVE
-	SOV	SHUT OFF VALVE
	CNV	CONTROL VALVE
	BFV	BUTTERFLY VALVE
	-	UNION
	-	REDUCER
	CP	CENTRIFUGAL PUMP
	POC	POINT OF CONNECTION

NOTE: ALL SYMBOLS MAY NOT APPLY

REFERENCE SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
# / SHEET	GENERAL REFERENCE DESIGNATES SHEET NUMBER	NAME / #	EQUIPMENT NAME AND NUMBER
# / SHEET	DETAIL REFERENCE TOP DESIGNATES DETAIL NUMBER BOTTOM DESIGNATES SHEET NUMBER	#	SHEET KEYNOTE NUMBER
		#	REVISION NUMBER
# / X0.0	SECTION REFERENCE TOP DESIGNATES SECTION NUMBER BOTTOM DESIGNATES SHEET NUMBER		ELEVATION SYMBOL
			NEW CONNECTION TO EXISTING

MECHANICAL SPECIFICATIONS

NOTE: NOT ALL SPECIFICATIONS MAY APPLY.

NOTICE TO OWNERS, ARCHITECTS AND CONTRACTORS REGARDING PRICING ESTIMATES
1. UNDER NO CIRCUMSTANCES SHALL THESE DRAWINGS BE "FINAL" OR "HARD BID" UNTIL THE PROJECT IS FULLY PERMITTED.
2. ALL PRELIMINARY PRICING EFFORTS SHALL BE CONSIDERED AS ESTIMATES ONLY AND SHALL INCLUDE SUCH CONTINGENCIES, ALLOWANCES, ALTERNATIVES, ETC. TO ACCOUNT FOR MODIFICATIONS AND ADDITIONS THAT WILL OCCUR TO THE DRAWINGS DURING FINALIZATION OF THE DESIGN AND PERMITTING PROCESS.

SCOPE OF WORK
1. THE WORK INCLUDED UNDER THIS SECTION CONSISTS OF FURNISHING ALL MATERIALS, EQUIPMENT AND LABOR, AND THE PERFORMING OF ALL FUNCTIONS, EXCEPT AS OTHERWISE SPECIFIED HEREIN OR SHOWN ON THE DRAWINGS TO BE PERFORMED BY OTHERS, AND FOR THE INSTALLATION OF ALL HEATING AND COOLING EQUIPMENT, PIPING AND ALL DUCTWORK, GRILLES,REGISTERS, ETC., INCLUDING ALL CONNECTIONS TO EACH SYSTEM AS SPECIFIED HEREIN AND SHOWN ON THE DRAWINGS. IT SHALL FURTHER INCLUDE FURNISHING AND INSTALLING ALL MISCELLANEOUS ITEMS REQUIRED FOR THE OPERATION OF THE SYSTEM, WHETHER SPECIFICALLY CALLED OUT OR NOT.
2. SPECIAL INSPECTIONS: WHERE THE PLANS INDICATE SPECIAL INSPECTIONS AND REPORT, OR AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION (AHJ), THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, HIRE AN INDEPENDENT THIRD PARTY INSPECTOR OR TESTING AGENCY TO PERFORM THE REQUIRED INSPECTIONS FOR THE TYPES OF WORK REQUIRED OR IDENTIFIED ON THE SPECIAL INSPECTION FORM. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT TO THE REGISTERED DESIGN PROFESSIONAL ENGINEER, PROVIDING TEST RESULTS AND STATING WHETHER THE ITEMS REQUIRING SPECIAL INSPECTION WERE IN COMPLIANCE WITH THE INSPECTION REQUIREMENTS. PROVIDE ADDITIONAL COST FOR ENGINEER'S SEALED LETTER OF APPROVAL.

COORDINATION
1. CONTRACT DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO SHOW APPROXIMATE LOCATIONS. COORDINATE WORK WITH ALL TRADES TO AVOID INTERFERENCE. INSTALLED HVAC WORK WHICH INTERFERES WITH THE WORK OF OTHER TRADES DUE TO LACK OF COORDINATION SHALL BE RE-INSTALLED AT NO ADDITIONAL COST TO THE OWNER.
2. REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF EQUIPMENT, PARTITIONS, WALLS, AND GENERAL CONSTRUCTION.
3. ALL CONTRACTORS SHALL BE RESPONSIBLE FOR COORDINATING WORK WITH OTHER TRADES AFFECTED BY EACH OTHERS WORK.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL FIELD CONDITIONS WHICH MAY AFFECT HIS WORK BEFORE SUBMITTING BIDS.
5. PERFORMANCE OF ALL WORK SHALL BE SCHEDULED AS APPROVED BY THE OWNER. AVOID INTERFERENCE WITH FUNCTIONS IN OTHER PARTS OF THE FACILITY, AND COORDINATE WITH THE WORK OF OTHER TRADES. SERVICES SHALL NOT BE INTERRUPTED WITHOUT WRITTEN PRIOR APPROVAL OF THE OWNER.
6. NO STRUCTURAL MEMBER SHALL BE CUT WITHOUT PERMISSION FROM THE ARCHITECT AND THE STRUCTURAL ENGINEER.
7. PROTECT EXISTING BUILDING STRUCTURE AND GROUNDS FROM DAMAGE WHICH MAY OCCUR DURING DEMOLITION WORK. ANY DAMAGE TO THE EXISTING FACILITIES SHALL BE REPAIRED, REPLACED, OR RESTORED TO THE ORIGINAL CONDITION AT NO ADDITIONAL COST AND TO THE SATISFACTION OF THE OWNER.
8. SPACE ABOVE CEILINGS IS CRITICAL - THE CONTRACTOR SHALL VERIFY SPACE ABOVE CEILING & COORDINATE WITH PLUMBING, ELECTRICAL, STRUCTURAL, FIRE PROTECTION, ARCHITECTURAL, AND ALL OTHER TRADES INVOLVED BEFORE COMMENCEMENT OF WORK.

CODES AND PERMITS
1. ALL MATERIALS, EQUIPMENT AND INSTALLATION MUST COMPLY WITH ALL APPLICABLE LAWS, CODES, RULES AND REGULATIONS, REQUIRED BY CITY, COUNTY AND STATE, AS WELL AS FEDERAL REQUIREMENTS.
2. COMBUSTIBLE MATERIALS SHALL NOT BE USED IN A NON-COMBUSTIBLE BUILDING AS DEFINED BY THE BUILDING CODE. COMBUSTIBLE MATERIALS MAY BE PROTECTED AS SPECIFIED BY THE ENGINEER AND ARCHITECT OF RECORD.
3. PERMITS: OBTAIN AND PAY FOR ALL REQUIRED PERMITS, LICENSES AND FEES.
4. INSPECTIONS: FURNISH OWNER WITH CERTIFICATE OF INSPECTION AND APPROVAL BY LOCAL AUTHORITIES PRIOR TO FINAL ACCEPTANCE OF THE PROJECT BY THE OWNER. ALL WORK MUST BE INSPECTED.

EXISTING CONDITIONS
1. PRIOR TO COMMENCING WORK, MECHANICAL CONTRACTOR SHALL CLEAN, TEST AND INSPECT ALL EXISTING MECHANICAL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO INSURE THAT ALL EQUIPMENT IS IN SATISFACTORY WORKING CONDITION. CONTRACTOR SHALL INCLUDE IN HIS BID THE REPLACEMENT OF FILTERS, CLEANING OF CONDENSATE DRAIN PANS AND DRAIN LINES, EVAPORATOR AND CONDENSER COILS AND THE REPLACEMENT OF FAN BELTS. CHARGE REFRIGERANT GAS AS REQUIRED. REPORT ANY DEFECTS/DEFICIENCIES TO OWNER/ARCHITECT IMMEDIATELY. SUBMIT ADDENDUM BID TO ACCOMMODATE ANY REPAIR/REPLACEMENTS AS REQUIRED.
2. VERIFY EXACT SIZE, LOCATION, ROUTING, ETC., OF ALL EXISTING MECHANICAL EQUIPMENT, DUCTWORK, AIR DEVICES, THERMOSTATS, SENSORS, PIPING, ETC., WHICH ARE TO BE REMOVED, REPLACED, ABANDONED, REWORKED, ETC., AS REQUIRED AND SHOWN ON DRAWINGS.
3. MECHANICAL WORK SHOWN AS EXISTING IS FOR REFERENCE ONLY. FIELD VERIFY ALL EXISTING CONDITIONS. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY SHOULD THE FIELD CONDITIONS DIFFER FROM THE DRAWINGS IN SUCH A WAY AS TO COMPROMISE THE DESIGN.
4. CONTRACTOR SHALL ENSURE ALL SURFACES (FLOORS, WALLS, CEILINGS AND ROOF) ARE BROUGHT BACK TO ORIGINAL CONDITION IN ACCORDANCE WITH ARCHITECTS REQUIREMENTS AFTER MODIFICATIONS HAVE BEEN MADE. COORDINATE WITH GENERAL CONTRACTOR.

SEISMIC REQUIREMENTS (IF APPLICABLE FOR PROJECT LOCATION)
1. COORDINATE WITH ARCHITECT AND STRUCTURAL ENGINEER FOR INFORMATION REGARDING THE REQUIRED SEISMIC ZONE FOR THE PROJECT.
2. ROOF TOP UNITS SHALL BE SECURED TO THE ROOF CURBS PER MANUFACTURER'S REQUIREMENTS ACCORDING TO THE SEISMIC ZONE.
3. ROOF CURBS SHALL BE SECURED TO THE ROOF IN AN APPROVED MANOR ACCORDING TO THE SEISMIC ZONE.
4. PROVIDE DUCT AND PIPING SUPPORTS, PROPERLY BRACED ACCORDING TO SMACNA GUIDELINES FOR THE SEISMIC ZONE INDICATED.

PRODUCTS
1. ALL PRODUCTS SHALL BE NEW AND UNUSED OF ESTABLISHED AND REPUTABLE AMERICAN MANUFACTURERS. ITEMS OF EQUIPMENT USED FOR THE SAME PURPOSE SHALL BE OF THE SAME MANUFACTURER.
2. SYSTEMS SHALL BE COMPLETE AND OPERABLE. ANY ACCESSORIES REQUIRED FOR THE OPERATION OF THE SYSTEM SHALL BE INCLUDED AS THOUGH SPECIFICALLY INDICATED TO BE PROVIDED. SUCH ACCESSORIES WOULD INCLUDE FILTERS, CONDENSATE DRAINS, RELIEF VALVES, SERVICE VALVES, THERMOSTATS, VIBRATION ISOLATORS, ETC. MOTOR STARTERS FOR PREWIRED EQUIPMENT (AND OTHER PROTECTION AND CONTROL DEVICES) ARE ALSO INCLUDED IN THIS SPECIFICATION.
3. SPECIFIC REFERENCE TO A MANUFACTURER'S PRODUCT IS ONLY TO ESTABLISH TYPE, QUALITY, AND PERFORMANCE REQUIRED. THESE QUALIFICATIONS ARE IN ADDITION TO THE REQUIREMENTS SHOWN ON THE DRAWINGS AND WITHIN THESE SPECIFICATIONS. LISTING OF ALTERNATE EQUIPMENT MANUFACTURERS SHALL NOT BE CONSTRUED AS AN UNCONDITIONAL APPROVAL OF THE PRODUCTS OF THOSE MANUFACTURERS.
4. ACCEPTABLE HVAC EQUIPMENT MANUFACTURERS: CARRIER, TRANE, YORK, LENNOX, APPROVED EQUAL OR AS SPECIFIED ELSEWHERE IN THESE DOCUMENTS.
5. PROVIDE CLEARANCES AS PER MANUFACTURERS RECOMMENDATIONS.

SUBSTITUTIONS
1. SUBSTITUTIONS OF MATERIALS OR PRODUCTS SHOWN HEREIN SHALL BE BY OWNER'S, ARCHITECTS, OR ENGINEER'S WRITTEN APPROVAL. ANY DEVIATION FROM THESE DRAWINGS WILL NOT BE ALLOWED.
2. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ANY SUBSTITUTIONS AND COSTS OF CHANGES INCURRED BY OTHER TRADES DUE TO THE SUBSTITUTIONS. OTHER TRADES INCLUDE: ELECTRICAL, PLUMBING, STRUCTURAL, ROOFING, OR ANY TRADE EFFECTED BY THE SUBSTITUTION.

SHOP DRAWING SUBMITTALS
1. PRIOR TO PROCUREMENT, CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR REVIEW FOR ALL EQUIPMENT, INCLUDING THE FOLLOWING:
   A. DIFFUSERS, REGISTERS, LOUVERS AND FLEXIBLE DUCTWORK.
   B. PACKAGED ROOFTOP UNITS, SPLIT-SYSTEM AIR HANDLING UNITS, CONDENSING UNITS, EVAPORATIVE COOLING UNITS AND EXHAUST FANS.
   C. THERMAL INSULATION, ACOUSTIC LINER AND FIRE DAMPERS.
   D. PIPING, SUPPORTS AND VALVES.
   E. AUTOMATIC TEMPERATURE CONTROLS.

THERMOSTATS, CONTROLS AND CONTROL WIRING
1. ALL CONTROL EQUIPMENT, INTEGRAL STARTERS, INTERLOCKING STARTERS, SMOKE DETECTORS, RELAYS, TRANSFORMERS, PANELS AND OTHER DEVICES SHOWN, SPECIFIED OR NEEDED FOR A COMPLETE CONTROL SYSTEM ARE TO BE PROVIDED AND INSTALLED UNDER THIS MECHANICAL DIVISION. COMPONENTS AND WIRING NOT SHOWN, BUT REQUIRED FOR THE PROPER OPERATION OF EQUIPMENT OR CONTROL SYSTEMS, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE PROJECT.
2. POWER WIRING, LOW VOLTAGE WIRING AND RACEWAYS RELATED TO CONTROLS SYSTEMS ARE TO BE PROVIDED AND INSTALLED UNDER THE MECHANICAL DIVISION.
3. INSTALLATION OF ALL EQUIPMENT, DEVICES AND WIRING SHALL CONFORM TO THE NATIONAL ELECTRIC CODE. ALL CONTROLS SHALL BE FURNISHED AND PROPERLY IDENTIFIED WITH INSTRUCTIONS FOR PROPER CONNECTIONS. RESPONSIBILITY FOR PROPER CONNECTIONS AND OPERATION IS INCLUDED UNDER THE MECHANICAL CONTRACTORS RESPONSIBILITY. VERIFY ALL VOLTAGES, PHASES AND ELECTRICAL CONNECTIONS WITH THE ELECTRICAL CONTRACTOR BEFORE ORDERING ANY EQUIPMENT, AND IF DISCREPANCIES OCCUR, THEY SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT BEFORE PROCEEDING WITH ANY WORK.
4. ALL TEMPERATURE CONTROLS ARE TO BE TESTED, ADJUSTED, AND CALIBRATED FOR PROPER OPERATION.
5. COORDINATE EXACT THERMOSTAT MOUNTING HEIGHT ABOVE FINISHED FLOOR AND FINAL LOCATION WITH THE ARCHITECT.
6. THERMOSTATS LOCATED ON EXTERIOR WALLS SHALL HAVE AN INSULATED SUB-BASE.

DUCT SMOKE DETECTORS
1. FIELD VERIFY FOR PRESENCE OF EXISTING DUCT SMOKE DETECTORS. TEST AS REQUIRED BY INSPECTOR.
2. WHERE NOT EXISTING, MECHANICAL CONTRACTOR TO PROVIDE AND INSTALL ALL DUCT SMOKE DETECTORS WHERE INDICATED ON THE DRAWINGS AND AS REQUIRED BY LOCAL ADOPTED CODES, LOCAL AMENDMENTS, THE BUILDING OFFICIAL, AND FOR ANY AIR HANDLING SYSTEM WITH A CAPACITY GREATER THAN 2000 CFM.
3. SMOKE DETECTORS SHALL BE POWERED BY 24 VOLT POWER. POWER MAY BE TAKEN FROM UNIT CONTROL TRANSFORMER IF APPROVED BY MANUFACTURER WITHOUT VOIDING WARRANTY. IF MANUFACTURER WILL NOT ALLOW ADDITIONAL CONTROL CIRCUIT LOAD, PROVIDE AND INSTALL A SECONDARY 24 VOLT TRANSFORMER POWERED FROM EQUIPMENT POWER SUPPLY TO CONTROL SMOKE DETECTOR. ALTERNATIVE 120 VOLT POWER PROVISIONS ARE ACCEPTABLE. THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ALL COSTS RELATED TO PROVIDING POWER TO SMOKE DETECTORS.
4. UPON ACTIVATION, SMOKE DETECTOR SHALL SHUT DOWN 24 VOLT CONTROL POWER CIRCUIT AND ALL OPERATIONAL CAPABILITIES OF THE AIR DISTRIBUTION SYSTEMS FOR THE CONNECTED UNIT.
5. INTERFACE DETECTORS TO SUPERVISORY CIRCUIT OF FIRE ALARM SYSTEM/FIRE SPRINKLER MONITORING PANEL. IN OCCUPANCIES NOT REQUIRED TO BE EQUIPPED WITH A FIRE ALARM SYSTEM, PROVIDE DUCT DETECTOR WITH A REMOTE LED INDICATOR LIGHT MOUNTED BELOW UNIT IN CEILING PER NFPA 72-5-10.6.08 OR AN APPROVED LOCATION. COORDINATE WITH ELECTRICAL/FIRE ALARM CONTRACTOR PRIOR TO ROUGH-IN

DUCTWORK
1. ALL DUCTWORK AND PLENUMS SHALL BE GALVANIZED SHEET METAL. FABRICATE AND INSTALL ALL DUCTWORK IN STRICT CONFORMANCE WITH THE LATEST SMACNA MANUAL, AND APPLICABLE MECHANICAL CODES FOR LOW VELOCITY DUCT CONSTRUCTION STANDARDS.
2. EACH DUCT SYSTEM SHALL BE COMPLETE WITH ALL REQUIRED DUCTWORK FITTINGS, TURNING VANES, SPLITTER DAMPERS AND SUPPORTS, AND EXTRACTORS AT ALL RIGHT ANGLE TAKEOFFS AND TEES.
3. DUCTWORK SHALL BE GALVANIZED, PRIME-GRADE, LOCK-FORMING QUALITY STEEL (LFQ) HAVING A GALVANIZED COATING OF 1-3/4 OUNCES TOTAL FOR BOTH SIDES OF ONE SQUARE FOOT OF A SHEET.
4. CROSSBREAK ALL SIDES OF ALL DUCTS IN ACCORDANCE WITH SMACNA GUIDELINES. DUCTWORK INSTALLATIONS SHALL MAKE NO OBJECTIONABLE NOISE, AND CONTRACTOR SHALL PROVIDE ANY ADDITIONAL STIFFENERS REQUIRED.
5. ALL LONGITUDINAL SEAMS SHALL BE PITTSBURGH LOCK SEAM, HAMMERED FLAT, WITH ALL TRANSVERSE JOINTS TAPED WITH 8 0Z. CANVAS AND SEALED WITH ARABOL, AIR TIGHT. DUCT TAPE IS NOT ALLOWED.
6. PROVIDE DOUBLE THICKNESS, FACTORY FABRICATED GALVANIZED SHEET STEEL TURNING VANES WITH AIRFOIL CONTOUR IN ALL RIGHT ANGLE ELBOWS, TEES, AND ELBOWS WITH RADIUS LESS THAN 1-1/2 TIMES THE WIDTH OF THE DUCT.
7. ALL ROUND DUCT BRANCH TAKEOFFS SHALL BE PROVIDED WITH SPIN-IN COLLAR AND BALANCING DAMPER.
8. DUCT SIZES SHOWN ON THE DRAWINGS ARE TO THE INSIDE OF ACOUSTICAL LININGS. INCREASE SIZES OF DUCTS AS REQUIRED TO ACCOMMODATE ACOUSTICAL INSULATION.
9. DUCTWORK SHALL CONFORM TO DIMENSIONS ON THE DRAWINGS, UNLESS LOCATION OF STRUCTURAL MEMBERS IS PROHIBITIVE. IN CASE OF CHANGE IN DIMENSIONS, CROSS SECTIONAL AREAS SHALL BE MAINTAINED.
10. ALL DUCTS SHALL BE SUBSTANTIALLY SUPPORTED WITH HANGERS TO THE STRUCTURE OR OTHERWISE DEPENDING ON LOCATION CONDITIONS, PLACING SUPPORTS NOT OVER 8 FEET APART ALONG THE LENGTH OF THE DUCT. HANGERS SHALL CONFORM TO ALL APPLICABLE MECHANICAL CODES AND SMACNA REQUIREMENTS.
11. FLEXIBLE ROUND DUCTS TO OUTLETS SHALL BE THERMALFLEX TYPE MKE, A MAXIMUM LENGTH OF 8'-0" LONG (AND ALLOWED ONLY WHERE INDICATED ON THE DRAWINGS).
12. ALL FACTORY-MADE DUCTS MUST BE CLASS 0 OR 1 AS APPROVED BY THE LOCAL APPLICABLE MECHANICAL CODE.
13. ALL MATERIALS EXPOSED WITHIN DUCTS OR PLENUMS SHALL HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25, AND A SMOKE-DEVELOPED RATING OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH THE TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS.

ACOUSTICAL LINER
1. SUPPLY, RETURN AND PLENUM DUCTS SHALL BE ACOUSTICALLY LINED FOR THE FIRST 15'-0" MINIMUM FROM UNIT CONNECTION POINTS.
2. ALL SHEET METAL SUPPLY, RETURN AND PLENUM DUCTWORK REQUIRING ACOUSTICAL LINER SHALL BE LINED WITH 1" THICK LINER.

THERMAL DUCT AND PLENUM INSULATION
1. ALL SUPPLY AND RETURN DUCTS SHALL BE INSULATED IN ACCORDANCE WITH THE PREVAILING ENERGY CODE (IECC OR TITLE 24). PROVIDE WATERPROOF ALUMINUM JACKETING FOR OUTDOOR INSULATED DUCTS. EXPOSED UN-INSULATED SUPPLY AIR DUCTS IN CONDITIONED SPACES WILL NOT BE ALLOWED WITHOUT PRIOR WRITTEN REQUEST AND APPROVAL BY THE OWNER AND MECHANICAL ENGINEER.
2. ALL RESIDENTIAL SUPPLY AND RETURN DUCTS SHALL BE INSULATED WITH R-8 INSULATION.
3. EXHAUST DUCTS SHALL NOT BE INSULATED.
4. ALL INSULATION AND LINERS, MATERIAL, COVERINGS, ADHESIVE, VAPOR-BARRIERS AND TAPES SHALL CONFORM TO NFPA 90A, FLAME SPREAD CLASSIFICATION NOT TO EXCEED 25 AND SMOKE DEVELOPMENT, NOT TO EXCEED 50.
5. EXTERNALLY INSULATED DUCTS
   A. ALL EXTERNALLY INSULATED DUCTS SHALL BE INSULATED WITH MINIMUM 2" THICK .75 LB. DENSITY FIBERGLASS BLANKET WITH FRK (FOIL REINFORCED KRAFT) VAPOR BARRIER FACING. INSULATION SHALL HAVE A CONDUCTIVITY NOT TO EXCEED 0.27 BTU PER INCH PER SQUARE FOOT PER DEGREE FAHRENHEIT PER HOUR AT 75 DEGREE FAHRENHEIT MEAN TEMPERATURE.
   B. INSULATION SHALL BE WRAPPED TIGHTLY ON THE DUCTWORK WITH ALL CIRCUMFERENTIAL JOINTS BUTTED AND LONGITUDINAL JOINTS OVERLAPPED A MINIMUM OF 2". ADHERE INSULATION TO METAL ON THE BOTTOM OF RECTANGULAR DUCTWORK OVER 24" WIDE WITH 4" STRIP OF INSULATION BONDING ADHESIVE, BENJAMIN FOSTER 85-15, OR EQUAL, AND ADDITIONALLY SECURE INSULATION WITH MECHANICAL FASTENERS AT NOT MORE THAN 18" O/C. ON ALL JOINTS, THE 2" FLANGE OF THE FACING OR THE 2" OVERLAP SHALL BE SECURED USING 9/16" FLARE-DOOR STAPLES APPLIED 6" O/C AND TAPED WITH MINIMUM 3" WIDE FOIL REINFORCED KRAFT TAPE. ALL PIN PENETRATIONS OR PUNCTURES IN FACING SHALL ALSO BE TAPED. VERTICAL DUCTS SHALL HAVE INSULATION ADEQUATELY SECURED TO PREVENT SLIPPING.
6. INTERNALLY INSULATED DUCTS
   A. MATERIAL: MINIMUM 1-1/2 LB. NEOPRENE OR HEAVY DENSITY COATED FIBERGLASS DUCT LINER SUITABLE FOR VELOCITIES UP TO 4,000 FPM COMPLYING WITH NFPA 90A.
   B. APPLICATION: COATED DUCT LINER SHALL BE CUT TO ASSURE OVERLAPPED AND COMPRESSED LONGITUDINAL CORNER JOINTS. APPLY LINER WITH COATED SURFACE FACING THE AIR STREAM AND ADHERED WITH 100% COVERAGE FIRE RETARDANT ADHESIVE. COAT ALL EXPOSED LEADING EDGES AND ALL TRANSVERSE JOINTS WITH FIRE RETARDANT ADHESIVE. THE LINER SHALL BE ADDITIONALLY SECURED WITH MECHANICAL FASTENERS WHICH SHALL COMPRESS THE DUCT LINER SUFFICIENTLY TO HOLD IT FIRMLY IN PLACE AS FOLLOWS:
   C. INSTALLATION FOR VELOCITIES TO 2,000 FPM: FASTENERS SHALL START WITHIN 3" OF THE UPSTREAM TRANSVERSE EDGES OF THE LINER AND 3" FROM THE LONGITUDINAL JOINTS AND SHALL BE SPACED AT A MAXIMUM OF 12" O.C. AROUND THE PERIMETER OF THE DUCT, EXCEPT THAT THEY MAY BE A MAXIMUM OF 12" FROM A CORNER BREAK. ELSEWHERE, THEY SHALL BE MAXIMUM OF 18" O.C. EXCEPT THAT THEY SHALL BE PLACED NOT MORE THAN 6' FROM A LONGITUDINAL JOINT OF THE LINER NOR 12" FROM A CORNER BREAK. COAT ALL EXPOSED JOINTS AND EDGES OF TRANSVERSE JOINTS WITH A FIRE RETARDANT ADHESIVE.
   D. OUTDOOR DUCTWORK SHALL BE INSULATED INTERNALLY WITH 2" DUCT LINER. INSTALL PER MANUFACTURERS INSTRUCTIONS. ALL OUTDOOR DUCTWORK JOINTS SHALL BE SEALED WITH SILICONE SEALANT AND MADE COMPLETELY WATERTIGHT AND LEAK PROOF.

GRILLES, REGISTERS AND DIFFUSERS
1. FURNISH AND INSTALL ALL GRILLES, REGISTERS, CEILING DIFFUSERS AND DOOR GRILLES WHERE INDICATED. THEY SHALL BE OF SIZE AND MODEL CALLED FOR ON THE DRAWINGS.
2. ALL GRILLES, REGISTERS, AND CEILING DIFFUSERS MUST BE SET FLUSH AND TRUE TO WALL OR CEILING TO PREVENT AIR LEAKAGE AROUND EDGES. ALL UNITS SHALL BE PROVIDED WITH NEOPRENE GASKETING AROUND THE INSIDE OF THE FRAME.
3. ALL UNITS SHALL BE FACTORY FINISHED, OF COLOR SELECTED BY THE ARCHITECT, OR AS OTHERWISE INDICATED.
4. PAINT ALL DUCTWORK, TURNING VANES, INSULATION, ETC. THAT IS VISIBLE THROUGH GRILLES, REGISTERS, OR CEILING DIFFUSERS FLAT BLACK.

RELIEF VENTS
1. ALL RELIEF VENT EXTERIOR PENETRATIONS SHALL BE PROVIDED WITH COUNTERBALANCED BAROMETRIC BACKDRAFT DAMPERS.

EQUIPMENT
1. ALL MECHANICAL EQUIPMENT SHALL BE PROPERLY LISTED AND LABELED BY AN APPROVED AGENCY.
2. ALL EQUIPMENT SHALL BE LABELED WITH STEEL TAGS EMBOSSED WITH 1/4" HIGH LETTERS, PERMANENTLY ATTACHED. TAG SHALL CLEARLY INDICATE THE AREA SERVED BY THE EQUIPMENT.
3. MAINTAIN MANUFACTURER'S RECOMMENDATIONS FOR ALL REQUIRED SERVICE CLEARANCES AND INSTALLATION OF EQUIPMENT.
4. REFER TO ARCHITECTURAL DRAWINGS FOR ACCESS TO ROOF INSTALLED MECHANICAL EQUIPMENT. ROOF ACCESS TO COMPLY WITH THE MECHANICAL CODE ADOPTED BY THE LOCAL JURISDICTION.

AIR CONDITIONING AND REFRIGERATION PIPING
1. COPPER TUBE WITH BRAZE JOINTS
2. TYPE ACR HARD OR ANNEALED TEMPER SEAMLESS COPPER TUBING ASTM B280
3. BRAZED JOINT PRESSURE FITTINGS ASME B16.50 WROUGHT COPPER ALLOY
4. JOINTS: FLARED OR BRAZED: ASTM A5.8 BCUP-SERIES COPPER-PHOSPHORUS ALLOYS.

CONDENSATE DRAIN
1. FOR EACH HVAC UNIT, PROVIDE FULL SIZED 4" DEEP (MINIMUM) TRAPPED CONDENSATE DRAIN OF COPPER TYPE "M" HARD DRAWN. SCHEDULE 40 PVC ALLOWED FOR INDOOR PORTION OF DRAIN WITH DUCTED RETURN AIR HVAC SYSTEMS.
2. PVC DRAIN PIPING NOT ALLOWED IN PLENUM RETURNS. PROVIDE NON-TRAPPED DRAIN FOR EVAPORATIVE COOLING UNITS. FIELD VERIFY ROUTING IS NOT OVER CRITICAL SPACES CONTAINING WATER SENSITIVE EQUIPMENT.
3. ROUTE PIPING TO 6" ABOVE NEAREST FLOOR SINK, MOP SINK OR DRAIN OR AS INDICATED ON THE DRAWINGS. (LAVATORY TAILPIECE IS AN ACCEPTABLE RECEPTACLE IF ALLOWED BY OWNER AND AUTHORITY HAVING JURISDICTION.)
4. SLOPE ALL CONDENSATE PIPING AT A MINIMUM OF 1/8" PER FOOT.
5. INSTALL CLEAN OUTS AT EVERY 90 DEGREE TURN ON ALL CONDENSATE DRAIN LINES.
6. PROVIDE AN APPROVED SECONDARY DRAIN SYSTEM OR APPROVED WATER LEVEL DETECTION DEVICE CONFORMING TO UL508 WHERE DAMAGE TO ANY BUILDING COMPONENTS WILL OCCUR AS A RESULT OF OVERFLOW OR STOPPAGE OF THE PRIMARY CONDENSATE DRAIN SYSTEM.
7. INSULATE THE FIRST 8 FEET OF CONDENSATE DRAIN PIPING AND ANY ADDITIONAL CONDENSATE DRAIN PIPING WHERE ENVIRONMENTAL CONDITIONS MAY CAUSE CONDENSATION TO DRIP FROM PIPING.
8. PROVIDE MEANS OF PREVENTING DISSIMILAR METAL CONTACT BETWEEN ALL PIPING MATERIALS FROM ANY OTHER METAL OR STRUCTURAL MEMBER TO PREVENT GALVANIC ACTION BETWEEN THE TWO METALS.
9. WHERE CONDENSATE PUMPS ARE INSTALLED AND LOCATED IN UNINHABITABLE SPACES, THE PUMP OVERFLOW-DETECTION SWITCH SHALL BE WIRED TO THE APPLIANCE OR EQUIPMENT SERVED FOR UNIT SHUT-DOWN UPON PUMP FAILURE.

PIPE INSULATION
1. INSULATE THE FIRST 8 FEET OF CONDENSATE DRAIN PIPING AND ANY ADDITIONAL CONDENSATE DRAIN PIPING WHERE ENVIRONMENTAL CONDITIONS MAY CAUSE CONDENSATION TO DRIP FROM PIPING.
2. EXTERIOR INSULATION SHALL BE RATED FOR EXTERIOR USE OR PROVIDED WITH UV RATED PROTECTIVE COATING.
3. ALL HEATING WATER AND CHILLED WATER PIPING SHALL HAVE FIBERGLASS INSULATION WITH ASJ JACKET, ACHIEVING A THERMAL CONDUCTIVITY (K-FACTOR) OF 0.24 AT 75 DEGREES MEAN TEMPERATURE. INSULATION THICKNESS SHALL MEET THE REQUIREMENTS OF THE CURRENT IECC CODE.
4. THE MAXIMUM FIRE HAZARD CLASSIFICATION OF THE INSULATION SYSTEM SHALL NOT HAVE MORE THAN A FLAME SPREAD OF 25, A FUEL CONTRIBUTED RATING OF 50, AND A SMOKE DEVELOPED RATING OF 50 WHEN TESTED IN ACCORDANCE WITH U.L. REQUIREMENTS. PIPE COVERING SHALL BEAR THE U.L. LABEL.
5. INSULATE ALL FITTINGS, VALVE BODIES ETC. WITH SINGLE OR MULTIPLE LAYERS OF INSULATION WITH PREFABRICATED FITTINGS WITH P.V.C. JACKETS.
6. PROVIDE MANUFACTURER SUBMITTAL FOR ALL INSULATION MATERIALS.

FINAL TESTS
1. AN INDEPENDENT AABC OR NEBB CERTIFIED CONTRACTOR SHALL BALANCE AIR DISTRIBUTION TO VALUES LISTED ON DRAWINGS. A FINAL COPY OF THE TEST AND BALANCE REPORT SHALL BE PROVIDED TO THE ENGINEER UPON COMPLETION OF THE REPORT. A PROJECT SHALL NOT BE CONSIDERED IN COMPLIANCE WITH THE PLANS AND SPECIFICATIONS UNTIL SUCH A REPORT HAS BEEN PROVIDED TO THE ENGINEER.
2. BEFORE ACCEPTANCE AND FINAL PAYMENT, IT SHALL BE DEMONSTRATED THAT ALL APPARATUS IS FUNCTIONING PROPERLY AND EFFICIENTLY. THE CONTRACTOR SHALL MAKE A THOROUGH TEST OF EACH SUPPLY, RETURN, AND EXHAUST SYSTEMS TO ASSURE THAT EACH DIFFUSER AND REGISTER HAS THE PROPER QUANTITY OF AIR IN ACCORDANCE WITH AABC OR NEBB. PROVIDE ADDITIONAL COMFORT BALANCE ADJUSTMENTS PER OWNER/TENANT REQUIREMENTS TO ADDRESS ANY NEEDED VARIATIONS IN DESIGN AIR FLOWS.
3. THE TEST AND BALANCE CONTRACTOR HAS THE RIGHT TO COMMUNICATE ANY INFORMATION TO THE MECHANICAL ENGINEER.

GUARANTEE
1. THE CONTRACTOR SHALL GUARANTEE ALL MATERIALS, EQUIPMENT AND WORKMANSHIP FROM DEFECT OF WORKMANSHIP, AND SHALL REPLACE OR REPAIR WITHOUT ADDITIONAL COST TO THE OWNER ALL DEFECTIVE MATERIAL AND WORKMANSHIP, FOR A PERIOD OF (1) YEAR AFTER COMPLETION AND ACCEPTANCE.

CLOSEOUT
1. PROVIDE OWNER WITH COMPLETE OPERATION AND MAINTENANCE MANUALS FOR ALL EQUIPMENT AND CONTROLS INSTALLED. DOCUMENTATION MUST INCLUDE EQUIPMENT CAPACITY (INPUT & OUTPUT), REQUIRED MAINTENANCE ACTIONS, CONTROLS AND CALIBRATION INFORMATION INCLUDING WIRING DIAGRAMS, CONTROL SEQUENCE DESCRIPTIONS, DESIRED OR FIELD-DETERMINED SETPOINTS, AND A COMPLETE NARRATIVE OF HOW EACH SYSTEM IS INTENDED TO OPERATE.
2. PROVIDE A COMPLETE SET OF FULL SIZE AS-BUILT DRAWINGS OF THE COMPLETE INSTALLATION INCLUDING ALL CHANGES MADE DURING CONSTRUCTION.

ORDER OF PRECEDENCE OF DOCUMENTS
1. SHOULD A CONFLICT ARISE BETWEEN CONSTRUCTION DOCUMENTS, THE ORDER OF PRECEDENCE SHALL BE:
   A. SPECIAL PROVISIONS
   B. GENERAL PROVISIONS
   C. SPECIFICATIONS
   D. DETAILS ON DRAWINGS
   E. PLAN DRAWINGS
2. THE ENGINEER OF RECORD SHALL BE NOTIFIED BEFORE A DECISION IS MADE.

2021 IECC COMPLIANCE NOTES

1. ALL SUPPLY AND RETURN AIR DUCTS AND PLENUMS SHALL BE INSULATED WITH A MINIMUM OF R-6 INSULATION WHEN LOCATED IN UNCONDITIONED SPACES AND A MINIMUM OF R-8 INSULATION WHEN LOCATED OUTSIDE THE BUILDING. WHEN LOCATED WITHIN A BUILDING ENVELOPE ASSEMBLY, THE DUCT OR PLENUM SHALL BE SEPARATED FROM THE BUILDING EXTERIOR OR UNCONDITIONED OR EXEMPT SPACES BY A MINIMUM OF R-8 INSULATION.
   EXCEPTIONS:
   1. WHEN LOCATED WITHIN EQUIPMENT.
   2. WHEN THE DESIGN TEMPERATURE DIFFERENCE BETWEEN THE INTERIOR AND THE EXTERIOR OF THE DUCT OR PLENUM DOES NOT EXCEED 15 DEG. F.
2. PROVIDE AUTOMATIC CHANGEOVER 7-DAY PROGRAMMABLE THERMOSTATS FOR EACH ZONE WITH A 2-HOUR OCCUPANT OVERRIDE, INTELLIGENT RECOVERY, AND 10-HOUR MINIMUM BATTERY BACKUP. PROGRAM SETBACK TEMPERATURES TO 85°F(COOL) AND 55° F (HEAT). THERMOSTATS USED TO CONTROL BOTH HEATING AND COOLING, SHALL PROVIDE A SETPOINT OVERLAP RESTRICTION SUCH AS A DEADBAND OF AT LEAST 5°F. ALL TEMPERATURE CONTROLS ARE TO BE TESTED, ADJUSTED, AND CALIBRATED FOR PROPER OPERATION. MOUNT ALL THERMOSTATS AND TEMPERATURE SENSORS AS INDICATED ON THE DRAWINGS. COORDINATE EXACT LOCATION WITH THE ARCHITECT. PROVIDE LOCKING COVER AS REQUIRED BY THE ARCHITECT OR THE OWNER. MOUNT BETWEEN 48"-54" AFF.
3. WHERE MECHANICAL VENTILATION IS PROVIDED, THE SYSTEM SHALL PROVIDE THE CAPABILITY TO REDUCE THE OUTDOOR AIR SUPPLY TO THE MINIMUM REQUIRED BY CHAPTER 4 OF THE INTERNATIONAL MECHANICAL CODE. OUTDOOR AIR SUPPLY AND EXHAUST DUCTS SHALL BE PROVIDED WITH AUTOMATIC MEANS TO REDUCE AND SHUT OFF AIRFLOW.
4. SEALING DUCTWORK: ALL JOINTS, LONGITUDINAL AND TRANSVERSE SEAMS AND CONNECTIONS IN DUCTWORK MUST BE SECURELY SEALED USING WELDMENTS; MECHANICAL FASTENERS WITH SEALS, GASKETS OR MASTICS; MESH AND MASTIC SEALING SYSTEMS; OR TAPES. TAPES AND MASTICS MUST BE LISTED AND LABELED IN ACCORDANCE WITH UL 181A OR 181B.
5. OUTDOOR AIR SUPPLY AND EXHAUST DUCTS SHALL BE EQUIPPED WITH MOTORIZED DAMPERS THAT WILL AUTOMATICALLY SHUT WHEN THE SYSTEMS OR SPACES SERVED ARE NOT IN USE. EXCEPTION - GRAVITY DAMPERS SHALL BE PERMITTED IN BUILDINGS LESS THAN 3 STORIES IN HEIGHT.
6. PROVIDE OWNER WITH COMPLETE OPERATION AND MAINTENANCE MANUALS FOR ALL EQUIPMENT AND CONTROLS INSTALLED. DOCUMENTATION MUST INCLUDE EQUIPMENT CAPACITY (INPUT & OUTPUT), REQUIRED MAINTENANCE ACTIONS, CONTROLS AND CALIBRATION INFORMATION INCLUDING WIRING DIAGRAMS, CONTROL SEQUENCE DESCRIPTIONS, DESIRED OR FIELD-DETERMINED SETPOINTS, AND A COMPLETE NARRATIVE OF HOW EACH SYSTEM IS INTENDED TO OPERATE.

CODE INFORMATION

A. 2021 IBC, 2021 IMC, 2021 IECC & CITY OF BEAUMONT AMENDMENTS. ALL SYSTEMS SHALL BE IN COMPLIANCE WITH THE ABOVE CODES AS ADOPTED BY THE CITY OF BEAUMONT.

B. OUTDOOR AIR VENTILATION PROVIDED AND BASED ON CHAPTER 4, SECTION 403.2 AND TABLE 403.3.1.1 AND ASHRAE 62.1-2010.

C. DUCT SMOKE DETECTORS REQUIRED BY SECTION 606 SHALL BE INSTALLED IN THE RETURN AIR SYSTEM. DETECTORS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 606.3 AND NFPA 72. DUCT SMOKE DETECTORS REQUIRE A REMOTE TEST VISUAL/TEST STATION PER NFPA 72. DETECTORS SHALL BE CONTROLLED PER SECTION 606.4.

D. EQUIPMENT AND APPLIANCES SHALL BE INSTALLED AS REQUIRED BY THE TERMS OF THEIR APPROVAL, IN ACCORDANCE WITH THE CONDITIONS OF THE LISTING, THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THIS CODE. MANUFACTURER'S INSTALLATION INSTRUCTIONS SHALL BE AVAILABLE ON THE JOB SITE AT THE TIME OF INSPECTION PER SECTION 304.1.

E. MATERIALS EXPOSED WITHIN PLENUMS SHALL HAVE A FLAME SPREAD RATING INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE TO ASTM E84.

F. ALL MATERIAL INSTALLED WITHIN PLENUMS SHALL CONFORM TO SECTION 602 PLENUMS.

G. MECHANICAL DESIGN IS INTENDED THAT THE AIR CONDITIONING SYSTEM WILL OPERATE CONTINUOUSLY TO MAINTAIN CURRENT VENTILATION REQUIREMENTS, IMC 403.2 & 403.3.

H. CALL FOR INSPECTION OF ALL MECHANICAL SYSTEMS PRIOR TO BACKFILL AND CONCEALMENT, IMC 107.2

I. MECHANICAL CONTRACTOR TO PROVIDE TWO COPIES PRELIMINARY REPORT OF PROPOSED SCHEDULES AND CHECK LISTS PER IECC C408.

J. MECHANICAL SYSTEMS COMMISSIONING IS REQUIRED PRIOR TO C OF O.

K. PROVIDE A COPY OF TEST AND BALANCE REPORT TO INSPECTOR AT TIME OF INSPECTION PER IMC 106.3 AND IMC 403.7

L. PER IMC, SECTION 304.12, ALL ROOF TOP EQUIPMENT AND APPLIANCES SHALL BE PERMANENTLY IDENTIFIED WITH THE AREA SERVED. INCLUDE ROOM NAME AND ROOM NUMBER

M. REFER TO ARCHITECTURAL PLANS FOR DETAILS ON ACCESS TO ROOF TOP EQUIPMENT AT DIFFERENT ELEVATIONS PER IMC SECTION 306.5.

M - MECHANICAL SHEET LIST

SHEET NUMBER	SHEET NAME
M0.1	MECHANICAL ABBREVIATIONS AND SYMBOLS
M0.2	MECHANICAL COMCHECK
M0.3	MECHANICAL COMCHECK
M1.1	MECHANICAL PLAN
M2.1	MECHANICAL SCHEDULES
M2.2	OUTSIDE AIR CALCULATIONS
M3.1	MECHANICAL DETAILS

TEXAS ENGINEER FIRM REGISTRATION #F-15201

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JOB NO: 240460
DFT: MJ / IF
DSN:MJ / IF
CHK:DEM

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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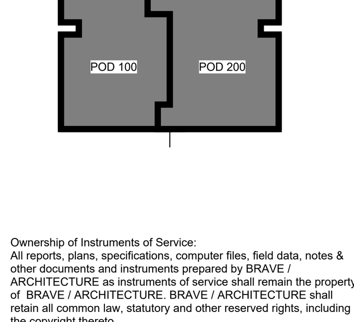
KEYPLAN:



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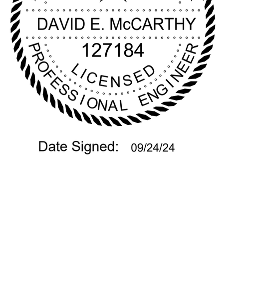

Date Signed: 09/24/24

FILE:
DRAWN BY: -
CHECKED BY: -
ISSUE:

MECHANICAL ABBREVIATIONS AND SYMBOLS

Scale: AS NOTED

M0.1

COM*check* Software Version COMcheckWeb

Mechanical Compliance Certificate

Project Information

Energy Code:	2021 IECC
Project Title:	JC Diversion Center Renovation
Location:	Beaumont, Texas
Climate Zone:	2a
Project Type:	Alteration

Construction Site:
3890 FM3514
BEAUMONT, Texas 77705

Owner/Agent:
BRAVE ARCHITECTURE
4200 MONTROSE BLVD, SUITE 400
HOUSTON, Texas 77006
713-524-5858

Designer/Contractor:
ASEI Engineering
350 Glenborough Drive #270
Houston, Texas 77067
7133009579

Mechanical Systems List

Quantity **System Type & Description**

1 FC-1 (Single Zone):
Heating: 1 each - Duct Furnace, Gas, Capacity = 58 kBtu/h
Proposed Efficiency = 96.00% Ec, Required Efficiency: 80.00 % Ec
Cooling: 1 each - Split System, Capacity = 17 kBtu/h, Air-Cooled Condenser, Unknown Economizer
Proposed Efficiency = 15.20 SEER2, Required Efficiency = 13.40 SEER2
Proposed Part Load Efficiency = 0.00 , Required Part Load Efficiency = 0.00
Fan System: FC-1 Fan -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 650 CFM, 1.0 motor nameplate hp, 0.00 fan energy index , fan exception: Part of code listed equipment

1 FC-2 & FC-3 (Single Zone):
Heating: 1 each - Duct Furnace, Gas, Capacity = 100 kBtu/h
Proposed Efficiency = 96.00% Ec, Required Efficiency: 80.00 % Ec
Cooling: 1 each - Split System, Capacity = 111 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 11.20 EER, Required Efficiency = 11.00 EER
Proposed Part Load Efficiency = 15.50 IEER, Required Part Load Efficiency = 14.60 IEER
Fan System: FC-2 Fan -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 2 Supply, Constant Volume, 4310 CFM, 5.0 motor nameplate hp, 0.00 fan energy index , fan exception: Part of code listed equipment

2 Water Heater:
Gas Storage Water Heater, Capacity: 110 gallons, Input Rating: 285 kBtu/h w/ Circulation Pump
Proposed Efficiency: 95.00 % Et, Required Efficiency: 80.00 % Et

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2021 IECC requirements in COMcheck-Version COMcheckWeb.jnt4s comply with any applicable mandatory requirements listed in the Inspection Checklist.

DAVID E. McCARTHY - MECHANICAL DESIGNER — Name - Title
David E. McCarthy — Signature
09.24.24 — Date

COM*check* Software Version COMcheckWeb

Inspection Checklist

Energy Code: 2021 IECC

Requirements: 85.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical and service water heating systems and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.13.2, C403.13.3 [FO9][1]	Snow/ice melting system and freeze protection systems have sensors and controls configured to limit service for pavement temperature above 50F and outdoor temperature above 40F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.6.1, C404.6.2 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1, C404.6.1.1 [PL8][1]	Demand recirculation water systems have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41][1]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.8.4 [ME142][1]	Motors for fans that are not less than 1/12 hp and less than 1 hp are electronically commutated motors or have a minimum motor efficiency of 70 percent. These motors have the means to adjust motor speed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.8.6 [ME143][1]	Each DX cooling system > 65 kBtu and chiller water/evaporative cooling system with fans > 1/4 hp are designed to vary the indoor fan airflow as a function of load and comply with detailed requirements of this section.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.9 [ME144][1]	Large diameter fans where installed shall be tested and labeled in accordance with AMCA 230.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.3 [ME55][1]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.5.5 [ME113][1]	Fault detection and diagnostics installed with air-cooled unitary DX units or VRF units having economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.2 [ME59][1]	Natural or mechanical ventilation is provided in accordance with International Mechanical Code Chapter 4. Mechanical ventilation has capability to reduce outdoor air supply to minimum per IMC Chapter 4.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.7.1 [ME59][1]	Demand control ventilation provided for spaces >500 ft2 and >15 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.7.2 [ME115][1]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.7.6 [ME141][1]	HVAC systems serving guestrooms in Group R-1 buildings with > 50 guestrooms: Each guestroom is provided with controls that automatically manage temperature setpoint and ventilation (see sections C403.7.6.1 and C403.7.6.2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.7.4 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.7.4(1) and C403.7.4(2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.7.5 [ME116][1]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.5, C403.5.1, C403.5.2 [ME62][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.5.3.3 [ME124][1]	Air economizers automatically reduce outdoor air intake to the design minimum outdoor air quantity when outdoor air intake will not reduce cooling energy usage. See Table C403.5.3.3 for applicable device types and climate zones.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.5.3.4 [ME125][1]	System capable of relieving excess outdoor air during air economizer operation to prevent over pressurizing the building. The relief air outlet located to avoid recirculation into the building.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.5.3.5 [ME126][1]	Return, exhaust/relief and outdoor air dampers used in economizers have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Reference section C403.7.7 for details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.1.4 [ME63][1]	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 80F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.3.3 [ME35][1]	Hot gas bypass limited to: <=240 kBtu/h - 50% >240 kBtu/h - 25%	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.2.1 [ME111][1]	Gas-fired water-heating equipment installed in new buildings: where a singular piece of water-heating equipment >= 1,000 kBtu/h serves the entire building, thermal efficiency >= 92 Et. Where multiple pieces of water-heating equipment serve the building with combined rating >= 1,000 kBtu/h, the combined input-capacity-weighted-average thermal efficiency >= 90 Et. Exclude input rating of equipment in individual dwelling units and equipment <= 100 kBtu/h.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.2.1 [ME53][1]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.11.3, C403.11.3.1, C403.11.3.2 [ME123][1]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.11.3.1 and refrigeration compressor systems that comply with C403.11.3.2..	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.7 [EL26][1]	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.8 [EL27][1]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.9.1, C405.9.2 [EL28][1]	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.10 [EL29][1]	Total voltage drop across the combination of feeders and branch circuits <= 5%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.1.1 [EL30][1]	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy >= 65 lm/W or luminaires with efficacy >= 45 lm/W or comply with C405.2.4 or C405.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.11, C405.11.1 [EL31][1]	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and > 25% of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

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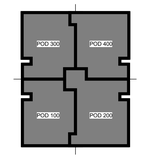

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Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.3 [FI8][1]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.3.1 [FI27][1]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.1 [FI47][1]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.1.2 [FI38][1]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.1.3 [FI20][1]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.2 [FI39][1]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.2.1, C403.4.2.2 [FI40][1]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.2.3 [FI41][1]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.3 [FI11][1]	Heat traps installed on supply and discharge piping of non-circulating systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.4 [FI25][1]	All piping insulated in accordance with section details and Table C403.12.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1 [FI12][1]	Controls are installed that limit the operation of a recirculation pump installed to maintain temperature of a storage tank. System return pipe is a dedicated return pipe or a cold water supply pipe.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.1.1 [FI57][1]	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.3.1 [FI31][1]	HVAC equipment, systems and system-to-system relationships have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.3.2 [FI10][1]	HVAC and service water heating control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.3.3 [FI32][1]	Economizers have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5 [FI7][1]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.1 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.2 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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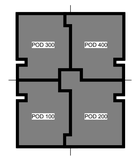

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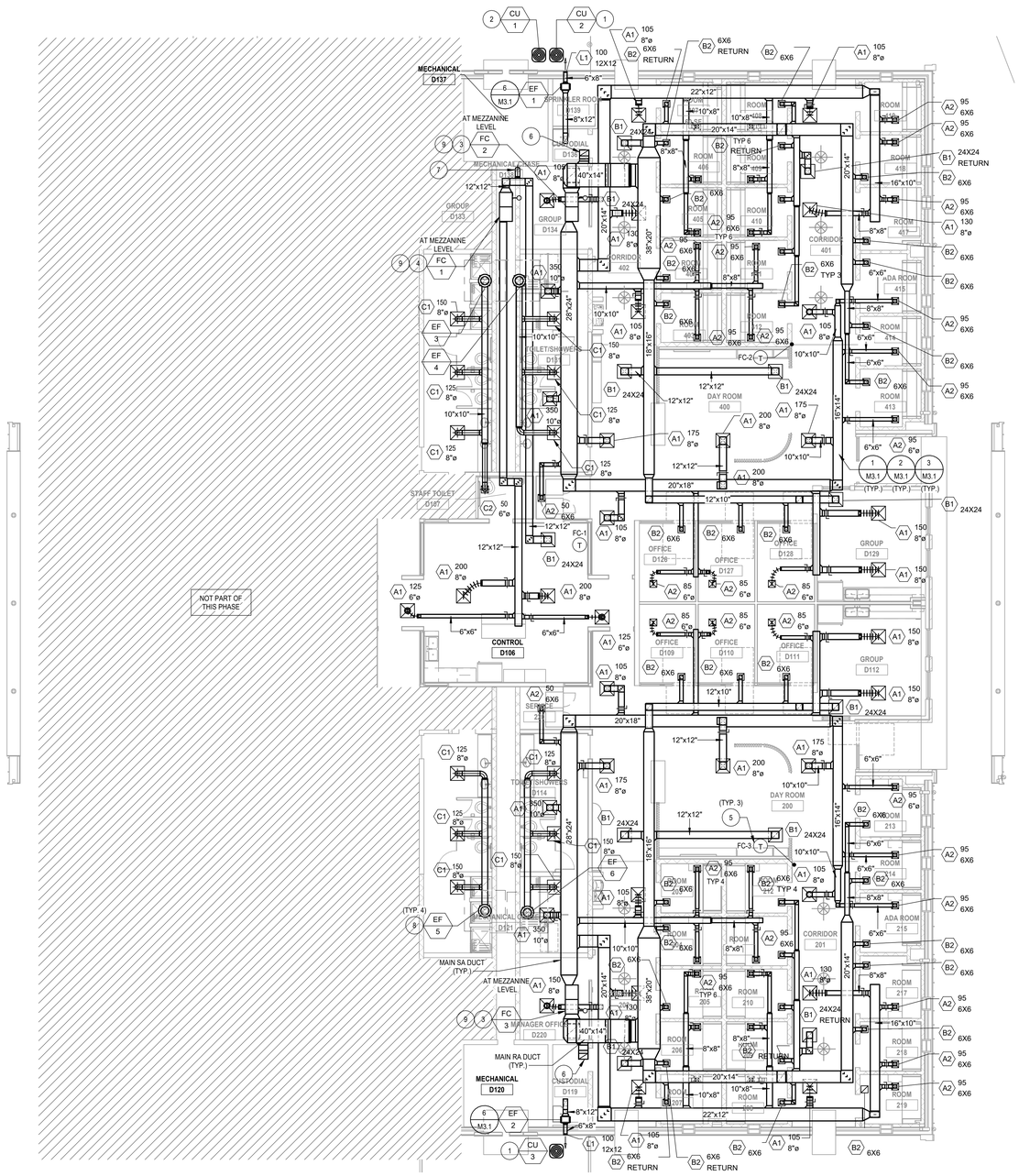

GENERAL NOTES

1. INSTALL ALL WORK IN ACCORDANCE WITH THE INTERNATIONAL MECHANICAL CODE AND THE REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION.
2. TO OBTAIN ALL CONSTRUCTION INFORMATION, ALL SPECIFICATIONS AND DRAWINGS (E.G. ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL, ELECTRICAL, PLUMBING AND FIRE PROTECTION) MUST BE USED.
3. BRING TO THE ATTENTION OF THE ARCHITECT/ENGINEER ANY INFORMATIONAL CONFLICTS WITHIN THE SPECIFICATIONS AND DRAWINGS. THE CONTRACTOR(S) SHALL NOT PROCEEED WITH ANY WORK, EXCEPT AT ITS OWN RISK, UNTIL ALL CONFLICTS ARE RESOLVED AND THE CLARIFYING INFORMATION IS ISSUED TO THE CONTRACTOR(S) BY THE ARCHITECT/ENGINEER.
4. PROVIDE OFFSETS AND TRANSITIONS IN DUCTWORK AND PIPING AS REQUIRED TO AVOID INTERFERENCE AT NO ADDITIONAL COST TO THE OWNER. THOUGH SOME OFFSETS & TRANSITIONS ARE SHOWN IN PIPING & SHEET METAL TO HELP INDICATE THE PHYSICAL RELATIONSHIP BETWEEN THEM, IT IS NOT THE INTENT OF THE DRAWINGS TO SHOW ALL PIPING & SHEET METAL OFFSETS & TRANSITIONS REQUIRED. THE CONTRACTOR SHALL FULLY COORDINATE THE MECHANICAL WORK WITHIN ITSELF & WITH THE WORK OF ALL TRADES TO PROVIDE COMPLETE & OPERABLE SYSTEMS WITHOUT INTERFERENCES.
5. INSTALL ALL EQUIPMENT LEVEL AND PLUMB. PROVIDE BLOCKING AND HARDWARE AS REQUIRED.
6. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATION OF WORK. PROVIDE TRANSITIONS AND MAKE FINAL CONNECTIONS TO EQUIPMENT, UNLESS OTHERWISE INDICATED.
7. INSTALL ALL EQUIPMENT REQUIRING PERIODIC SERVICE NOT LESS THAN 10 FEET FROM ROOF EDGE OR OPENING, UNLESS PROTECTIVE RAILING OR PARAPET OF 42 INCHES AFF. HAS BEEN PROVIDED. VERIFY WITH OTHER TRADES TO CONFIRM IF PROTECTIVE RAILING OR PARAPET OF 42 INCHES AFF IS PROVIDED.
8. CONCENTRATE LOADS AT JOIST AND/OR BEAM LOCATIONS. WHERE CONCENTRATED LOADS DUE TO EQUIPMENT, RISERS, OR SPECIAL DUCT CONSTRUCTION OCCUR AT OTHER LOCATIONS, PROVIDE ADDITIONAL SUPPORT FRAMING AND/OR ANGLE BRACING.
9. DUCT CONSTRUCTION SHALL COMPLY WITH THE LATEST VERSION OF SMACNA CONSTRUCTION STANDARDS FOR THE SPECIFIC PRESSURE CLASSIFICATIONS. ALL 90 DEGREE ELBOWS SHALL BE LONG RADIUS TYPE UNLESS SPACE IS LIMITED. SHORT RADIUS AND RECTANGULAR ELBOWS SHALL HAVE TURNING VANES. UNLESS OTHERWISE NOTED FOR BRANCH CONNECTIONS, PROVIDE CONICAL TAPS FOR ROUND DUCTS AND 45 DEGREE TAPS FOR RECTANGULAR DUCTS.
10. FLEXIBLE DUCTWORK SHALL NOT BE USED IN RETURN OR EXHAUST DUCT SYSTEMS. FLEXIBLE DUCTWORK MAY BE USED IN THE SUPPLY SYSTEM PROVIDED THE LENGTH IS LIMITED TO A TOTAL LENGTH OF FIVE (5) FEET.
11. INSTALL DUCTWORK AS CLOSE AS POSSIBLE TO UNDERSIDE OF BEAMS AND/OR JOISTS.
12. ALL DUCT WORK SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS.
13. PROVIDE DUCTWORK TO TERMINAL AIR DEVICES AT SCHEDULED INLET SIZE UNLESS OTHERWISE INDICATED.
14. PROVIDE DUCTWORK FROM TERMINAL AIR BOXES AT MANUFACTURER'S OUTLET DIMENSION SIZE UNLESS OTHERWISE INDICATED. PROVIDE TRANSITIONS AS REQUIRED.
15. COORDINATE WITH LIFE SAFETY PLANS FOR LOCATIONS OF ALL DUCTWORK PENETRATIONS AND FIRE RATED/SMOKE RESISTIVE CONSTRUCTIONS. PENETRATION ASSEMBLIES SHALL BE U.L. LISTED.
16. PAINT FLAT BLACK THE INSIDE OF ALL DUCTWORK VISIBLE THROUGH DIFFUSERS, GRILLES AND REGISTERS.
17. PROVIDE OPEN END DUCTWORK (OED) WITH 2X2 MESH (1/2"X 1/2") ALUMINUM SCREEN WITH REMOVABLE FRAMES.
18. FURNISH AND INSTALL ALL MANUALLY OPERATED VOLUME CONTROL (BALANCING) DAMPERS NECESSARY TO PERFORM THE BALANCING WORK, AT EACH BRANCH TAKEOFF, AT EACH AIR TERMINAL DEVICE AND WHERE INDICATED.
19. DUCT SYSTEMS SHALL BE BALANCED TO AIR FLOWS INDICATED ON DRAWINGS. FANS SHALL BE FIELD TESTED TO ENSURE COMPLIANCE WITH SCHEDULED FAN PERFORMANCE AND SCHEDULED AIR FLOW AT THE DESIGN STATIC PRESSURES LISTED.
20. PROVIDE FLEXIBLE CONNECTIONS BETWEEN DUCTWORK AND ALL FANS AND ALL AIR HANDLING EQUIPMENT.
21. COORDINATE EXACT LOCATION OF DIFFUSERS, GRILLES AND REGISTERS WITH THE REFLECTED CEILING PLANS BEFORE INSTALLATION. PROVIDE SYMMETRY WITH THE ROOM LIGHTING SYSTEMS.
    COORDINATE EXACT LOCATION OF DIFFUSERS, GRILLES AND REGISTERS WITH THE REFLECTED CEILING PLANS BEFORE INSTALLATION. PROVIDE SYMMETRY WITH THE ROOM LIGHTING SYSTEMS.
22. VERIFY DIFFUSER, GRILLE AND REGISTER MOUNTING FRAME TYPES WITH THE CEILING TYPES. PROVIDE FRAME TYPE THAT MATCHES CEILING CONFIGURATION.
23. PROVIDE CONCRETE HOUSEKEEPING PADS FOR FLOOR MOUNTED MECHANICAL EQUIPMENT. COORDINATE SIZE AND LOCATION WITH ALL TRADES.
24. PROVIDE ACCESS DOORS AND/OR PANELS FOR DUCT MOUNTED FIRE, SMOKE, AND FIRE/SMOKE DAMPERS AND SMOKE DETECTORS.
25. PROVIDE ACCESS DOORS AND/OR PANELS IN HARD CEILINGS AND WALLS TO PERMIT SERVICE TO DAMPERS, VALVES, AND CONCEALED EQUIPMENT.
26. REFER TO ARCHITECTURAL GENERAL INFORMATION SHEETS FOR MOUNTING HEIGHTS OF DEVICES. WHERE THIS INFORMATION IS NOT PROVIDED, MOUNT ROOM THERMOSTATS AT 48 INCHES AFF AND OCCUPANCY SENSORS AT 84 INCHES AFF UNLESS OTHERWISE INDICATED.
27. COORDINATE ALL WALL MOUNTED DEVICES SUCH AS THERMOSTATS AND CONTROL PANELS WITH ARCHITECTURAL INTERIOR ELEVATIONS.
28. COORDINATE ALL DOOR UNDER CUTS INDICATED AND AS REQUIRED WHERE RETURN/TRANSFER OPENS ARE NOT PROVIDED.
29. WHERE SIZE OF MOTORIZED DAMPER EXCEEDS THE LIMITS OF A SINGLE OPERATOR, PROVIDE MULTIPLE OPERATORS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
30. PROVIDE RUNOUT PIPING AS SCHEDULED OR AS OTHERWISE INDICATED.

KEYED NOTES

1. NEW 10-TON CONDENSING UNIT LOCATED OUTSIDE OF THE BUILDING AS SHOWN. MAINTAIN MANUFACTURER'S REQUIRED CLEARANCES.
2. NEW 2-TON CONDENSING UNIT LOCATED OUTSIDE OF BUILDING AS SHOWN. MAINTAIN MANUFACTURER'S REQUIRED CLEARANCES.
3. NEW 10-TON AIR HANDLING UNIT LOCATED ON MEZZANINE LEVEL. ROUTE 28x24 SUPPLY DUCT FROM UNIT. ROUTE 24X28 RETURN DUCT FROM UNIT AS SHOWN. SEE DETAIL 7/M3.1 FOR REFERENCE.
4. NEW 2-TON FAN COIL UNIT LOCATED ON MEZZANINE LEVEL. ROUTE 12x12 SUPPLY AND RETURN AIR DUCT FROM UNIT TO SPACE AS SHOWN. SEE DETAIL 7/M3.1 FOR REFERENCE.
5. PROVIDE 7-DAY PROGRAMMABLE T-STAT (IECC COMPLIANT). COORDINATE EXACT LOCATION OF TSTATS WITH ARCHITECT/TENANT PRIOR TO INSTALLATION.
6. ROUTE 16x10 OUTSIDE AIR DUCT UP TO ROOF. SEE DETAIL 5/M3.1 FOR REFERENCE.
7. ROUTE 8"Ø OUTSIDE AIR DUCT UP TO ROOF. SEE DETAIL 5/M3.1 FOR REFERENCE.
8. EXHAUST FAN LOCATED ON ROOF. MAINTAIN 10'-0" CLEARANCE MINIMUM TO FRESH AIR INTAKES. SEE DETAIL 4/M3.1 FOR REFERENCE.
9. ROUTE 3/4" CONDENSATE DRAIN PIPE WITH TRAP AND VENT FROM FAN COIL UNIT DOWN TO TERMINATE MINIMUM 6" CLEARANCE GAP FROM EXISTING FLOOR DRAIN. MAINTAIN 1/8" PER FOOT SLOPE MINIMUM FOR CONDENSATE DRAIN LINES. SEE DETAIL 8/M3.1 FOR REFERENCE.
10. INLINE EXHAUST FAN LOCATED IN CEILING SPACE. SEE DETAIL 6/M3.1 FOR REFERENCE.

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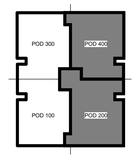

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M - GAS FURNACE/ELECT. COOLING SPLIT SYSTEM (INDOOR)

TAG	MARK	NOMINAL TONS	BASIS OF DESIGN				TOTAL CFM	OSA CFM	ESP/ IWG	GAS INPUT (MBH)	GAS EFF. (%)	MOTOR DATA			MAX. FLA	MOCP	OPERATING WEIGHT	SEER2/EER	COOLING CAPACITIES (GROSS)					HEATING CAPACITIES (GROSS)			REMARKS
			FAN COIL		FURNACE							HP	VOLTAGE	PHASE					ENT AIR		AMBIENT		MBH		ENT AIR DB	AMBIENT DB	TOTAL MBH	
			MANUFACTURER	MODEL	MANUFACTURER	MODEL													DB	WB	DB	WB	TOTAL	SENSIBLE				
FC	1	2	CARRIER	CAPM	CARRIER	59SC	650	SEE CALCS	0.8	60	96	1	208 V	3	10.1	15 A	200 lb	15.9 SEER2	78	64	95	78	17.7	14.6	-	31.4	58	SEE NOTES BELOW
FC	2	10	CARRIER	39LA10	REZNOR (DUCT HEATER)	SC125	4310	SEE CALCS	2.36	125	80	5.0	208 V	3	14.3	30 A	998 lb	11.2 EER	77.2	64	95	78	111	96	-	31.4	100	SEE NOTES BELOW
FC	3	10	CARRIER	39LA10	REZNOR (DUCT HEATER)	SC125	4310	SEE CALCS	2.36	125	80	5.0	208 V	3	14.3	30 A	998 lb	11.2 EER	77.2	64	95	78	111	96	-	31.4	100	SEE NOTES BELOW

NOTE:
1. MANUFACTURER SHALL SIZE REFRIGERANT LINES AND SHALL PROVIDE NECESSARY REFRIGERANT SPECIALTIES FOR LONG LINE APPLICATIONS, IF APPLICABLE.
2. MANUFACTURER TO GUARANTEE AND ASSURE PROPER OPERATION OF REFRIGERANT SYSTEM.
3. PROVIDE WITH 7 DAY PROGRAMMABLE T-STAT IN LOCKABLE COVER, AUTO-CHANGE OVER.
4. PROVIDE AN APPROVED SECONDARY DRAIN SYSTEM WHERE DAMAGE TO BUILDING COMPONENTS WILL OCCUR AS A RESULT OF OVERFLOW OR STOPPAGE OF THE PRIMARY CONDENSATE DRAIN.
5. PROVIDE ECONOMIZER AND BAROMETRIC RELIEF.
6. PROVIDE STAGED AIR VOLUME SUPPLY FAN (VFD) AND CONTROLS TO MEET 2021 IECC.
7. UNIT SHALL HAVE ECONOMIZER FAULT DETECTION AND DIAGNOSTICS IN ACCORDANCE WITH 2021 IECC C403.5.5.

SPLIT SYSTEM OUTDOOR CONDENSING UNIT SCHEDULE

TAG	MARK	NOMINAL TONS	BASIS OF DESIGN		ELECTRICAL DATA					AMBIENT DATA			SEER2/ EER	HSPF/ COP	OPERATING WEIGHT	REMARKS
			MANUFACTURER	MODEL	VOLTAGE	PHASE	MCA	MOCP	SCCR	AMB DB	AMB WB	WIN DB				
CU	1	1.5	CARRIER	24SCA	208 V	1	11.4 A	20 A	5KA	95	78	31	15.2 SEER2		113 lb	-
CU	2	10	CARRIER	38AUZ	208 V	3	45.0 A	60 A	5KA	95	78	31	11.2 EER		490 lb	-
CU	3	10	CARRIER	38AUZ	208 V	3	45.0 A	60 A	5KA	95	78	31	11.2 EER		490 lb	-

M - EXHAUST FAN SCHEDULE

TAG	MARK	SYSTEM	TYPE	CFM	FAN RPM	MOTOR DATA		MOTOR DATA	OPERATING WEIGHT	BASIS OF DESIGN		REMARKS
						HP	VOLTAGE	PHASE		MANUFACTURER	MODEL	
EF	1	EXHAUST	IN-LINE	100	980	0.03	115 V	1	24 lb	GREENHECK	CSP-A125-QD	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS
EF	2	EXHAUST	IN-LINE	100	980	0.03	115 V	1	24 lb	GREENHECK	CSP-A125-QD	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS
EF	3	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS
EF	4	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS
EF	5	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS
EF	6	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	CONTROL WITH TIMECLOCK SET FOR OPERATION DURING OCCUPIED HOURS

M - GRILLE, REGISTER, DIFFUSER SCHEDULE

TAG	SYSTEM	SIZE	DISCHARGE SOUND (NC)	MATERIAL	BORDER	DAMPER	FINISH	BASIS OF DESIGN		REMARKS
								MANUFACTURER	MODEL	
A1	SUPPLY	24X24	28	STEEL	FLANGED	No	BY ARCH	TITUS	TMS	
A2	SUPPLY	12X12	28	STEEL	FLANGED	No	BY ARCH	TITUS	TMS	
B1	RETURN	24X24	28	STEEL	FLANGED	No	BY ARCH	TITUS	350RL	
B2	RETURN	12X12	28	STEEL	FLANGED	No	BY ARCH	TITUS	350RL	
C1	EXHAUST	24X24	28	STEEL	FLANGED	Yes	BY ARCH	TITUS	350RL	
C2	EXHAUST	12X12	28	STEEL	FLANGED	Yes	BY ARCH	TITUS	350RL	
L1	LOUVER	12X12	28	ALUMINUM	FLANGED	Yes	BY ARCH	RUSKIN	ELF6375DXD	

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JOB NO: 240460
DFT: MJ / IF
DSN:MJ / IF
CHK:DEM

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STATE OF TEXAS
DAVID E. McCARTHY
127184
LICENSED
PROFESSIONAL ENGINEER

Date Signed: 09/24/24

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

MECHANICAL SCHEDULES

Scale: AS NOTED

M2.1

FCU-3 TOTAL OSA REQUIRED = 836 CFM
FCU-3 TO PROVIDE 850 CFM OSA

ZONE OR UNIT NO: GROUP D112			Total CFM	100
PSYCHIATRIC GROUP ROOM			243	SQ.FT.
OCC DENSITY =	50	PEOPLE / 1000 SQ.FT.		
243 X 50 / 1000 =	13	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	13	0.06	243	SQ.FT
	Vbz = (5 X 13) + (0.06 X 243) =		80	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		100	CFM
CORRIDORS			686	SQ.FT.
OCC DENSITY =	0	PEOPLE / 1000 SQ.FT.		
686 X 0 / 1000 =	0	PEOPLE		
R_P	P_Z	R_A	A_Z	
0	0	0.06	686	SQ.FT
	Vbz = (0 X 0) + (0.06 X 686) =		42	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		53	CFM
ZONE OR UNIT NO: OFFICE D09-D11			Total CFM	34
OFFICE SPACES			267	SQ.FT.
OCC DENSITY =	5	PEOPLE / 1000 SQ.FT.		
267 X 5 / 1000 =	2	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	2	0.06	267	SQ.FT
	Vbz = (5 X 2) + (0.06 X 267) =		27	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		34	CFM

ZONE OR UNIT NO: FOOM 203-212			Total CFM	184
CELLS			600	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
600 X 25 / 1000 =	15	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	15	0.12	600	SQ.FT
	Vbz = (5 X 15) + (0.12 X 600) =		147	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		184	CFM
ZONE OR UNIT NO: ROOM 213-219			Total CFM	143
CELLS			450	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
450 X 25 / 1000 =	12	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	12	0.12	450	SQ.FT
	Vbz = (5 X 12) + (0.12 X 450) =		114	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		143	CFM
ZONE OR UNIT NO: DAY ROOM 200			Total CFM	253
DAY ROOM			944	SQ.FT.
OCC DENSITY =	30	PEOPLE / 1000 SQ.FT.		
944 X 30 / 1000 =	29	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	29	0.06	944	SQ.FT
	Vbz = (5 X 29) + (0.06 X 944) =		202	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		253	CFM
ZONE OR UNIT NO: CORRIDOR 201 & 202			Total CFM	53

ZONE OR UNIT NO: STORAGE D119			Total CFM	9
STORAGE ROOMS			55	SQ.FT.
OCC DENSITY =	0	PEOPLE / 1000 SQ.FT.		
55 X 0 / 1000 =	0	PEOPLE		
R_P	P_Z	R_A	A_Z	
0	0	0.12	55	SQ.FT
	Vbz = (0 X 0) + (0.12 X 55) =		7	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		9	CFM
ZONE OR UNIT NO: GROUP D134			Total CFM	47
PSYCHIATRIC GROUP ROOM			115	SQ.FT.
OCC DENSITY =	50	PEOPLE / 1000 SQ.FT.		
115 X 50 / 1000 =	6	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	6	0.06	115	SQ.FT
	Vbz = (5 X 6) + (0.06 X 115) =		37	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		47	CFM
ZONE OR UNIT NO: ROOM 220			Total CFM	13
CELLS			34	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
34 X 25 / 1000 =	1	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	1	0.12	34	SQ.FT
	Vbz = (5 X 1) + (0.12 X 34) =		10	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		13	CFM

FCU-1 TOTAL OSA REQUIRED = 73 CFM
FCU-1 TO PROVIDE 75 CFM OSA

ZONE OR UNIT NO: CONTROL D106			Total CFM	73
OFFICE SPACES			620	SQ.FT.
OCC DENSITY =	5	PEOPLE / 1000 SQ.FT.		
620 X 5 / 1000 =	4	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	4	0.06	620	SQ.FT
	Vbz = (5 X 4) + (0.06 X 620) =		58	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		73	CFM

FCU-2 TOTAL OSA REQUIRED = 829 CFM
FCU-2 TO PROVIDE 850 CFM OSA

ZONE OR UNIT NO: STORAGE D136			Total CFM	4
STORAGE ROOMS			23	SQ.FT.
OCC DENSITY =	0	PEOPLE / 1000 SQ.FT.		
23 X 0 / 1000 =	0	PEOPLE		
R_P	P_Z	R_A	A_Z	
0	0	0.12	23	SQ.FT
	Vbz = (0 X 0) + (0.12 X 23) =		3	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		4	CFM
ZONE OR UNIT NO: GROUP D134			Total CFM	47
PSYCHIATRIC GROUP ROOM			115	SQ.FT.
OCC DENSITY =	50	PEOPLE / 1000 SQ.FT.		
115 X 50 / 1000 =	6	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	6	0.06	115	SQ.FT
	Vbz = (5 X 6) + (0.06 X 115) =		37	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		47	CFM
ZONE OR UNIT NO: ROOM 420			Total CFM	10
CELLS			20	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
20 X 25 / 1000 =	1	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	1	0.12	20	SQ.FT
	Vbz = (5 X 1) + (0.12 X 20) =		8	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		10	CFM

ZONE OR UNIT NO: FOOM 403-412			Total CFM	184
CELLS			600	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
600 X 25 / 1000 =	15	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	15	0.12	600	SQ.FT
	Vbz = (5 X 15) + (0.12 X 600) =		147	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		184	CFM
ZONE OR UNIT NO: ROOM 413-419			Total CFM	143
CELLS			450	SQ.FT.
OCC DENSITY =	25	PEOPLE / 1000 SQ.FT.		
450 X 25 / 1000 =	12	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	12	0.12	450	SQ.FT
	Vbz = (5 X 12) + (0.12 X 450) =		114	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		143	CFM
ZONE OR UNIT NO: DAY ROOM 400			Total CFM	254
DAY ROOM			952	SQ.FT.
OCC DENSITY =	30	PEOPLE / 1000 SQ.FT.		
952 X 30 / 1000 =	29	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	29	0.06	952	SQ.FT
	Vbz = (5 X 29) + (0.06 X 952) =		203	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		254	CFM

ZONE OR UNIT NO: GROUP D129			Total CFM	100
PSYCHIATRIC GROUP ROOM			243	SQ.FT.
OCC DENSITY =	50	PEOPLE / 1000 SQ.FT.		
243 X 50 / 1000 =	13	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	13	0.06	243	SQ.FT
	Vbz = (5 X 13) + (0.06 X 243) =		80	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		100	CFM
ZONE OR UNIT NO: CORRIDOR 401 & 402			Total CFM	53
CORRIDORS			686	SQ.FT.
OCC DENSITY =	0	PEOPLE / 1000 SQ.FT.		
686 X 0 / 1000 =	0	PEOPLE		
R_P	P_Z	R_A	A_Z	
0	0	0.06	686	SQ.FT
	Vbz = (0 X 0) + (0.06 X 686) =		42	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		53	CFM
ZONE OR UNIT NO: OFFICE D126-D128			Total CFM	34
OFFICE SPACES			270	SQ.FT.
OCC DENSITY =	5	PEOPLE / 1000 SQ.FT.		
270 X 5 / 1000 =	2	PEOPLE		
R_P	P_Z	R_A	A_Z	
5	2	0.06	270	SQ.FT
	Vbz = (5 X 2) + (0.06 X 270) =		27	CFM
	AIR DISTRIB.EFF.(Ez) =		0.8	
	Total OA Required = Voz = Vbz / Ez =		34	CFM

BASED ON 2021 IMC TABLE 403.1.1

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JOB NO: 240460 | DFT: MJ / IF | DSN: MJ / IF | CHK: DEM

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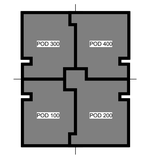
KEYPLAN:



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Date Signed: 09/24/24

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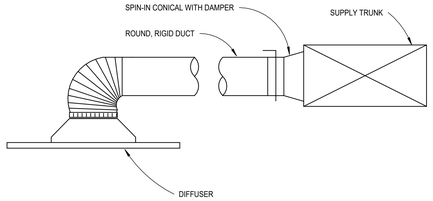
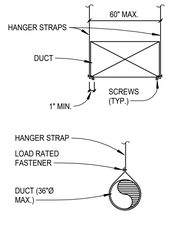
OUTSIDE AIR CALCULATIONS

Scale: AS NOTED

M2.2



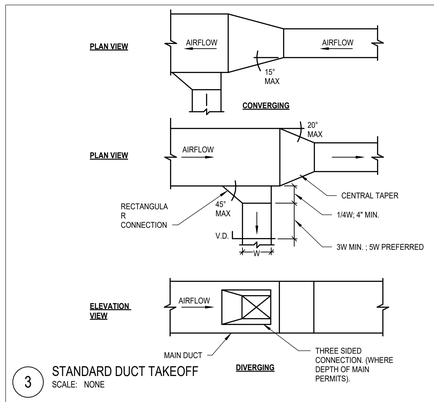
1 FLEX DUCT TAKEOFF
SCALE: NONE



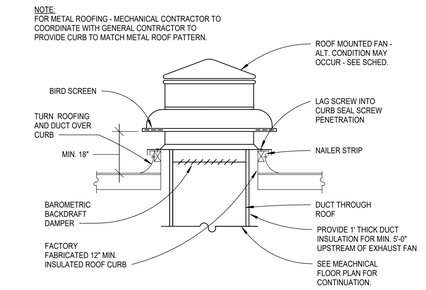
RECTANGULAR DUCT HANGERS		
DUCT PERIMETER	STRAP	STRAP
UP TO 60"	1" x 22 GA.	10' - 0"
61" TO 144"	1" x 18 GA.	10' - 0"
UP TO 60"	1" x 22 GA.	8' - 0"
61" TO 144"	1" x 20 GA.	8' - 0"

ROUND DUCT HANGERS		
DUCT PERIMETER	STRAP	STRAP
UP TO 10"	1" x 22 GA.	12' - 0"
11" TO 18"	1" x 22 GA.	12' - 0"
19" TO 24"	1" x 22 GA.	12' - 0"
25" TO 36"	1" x 20 GA.	12' - 0"

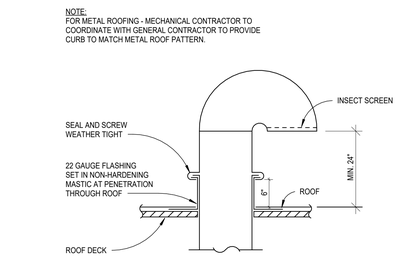
2 DUCT HANGER
SCALE: NONE



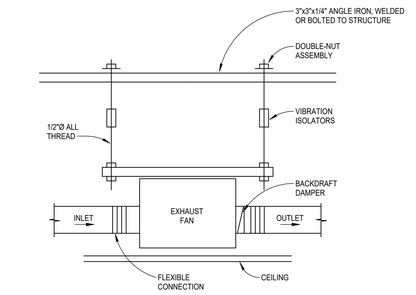
3 STANDARD DUCT TAKEOFF
SCALE: NONE



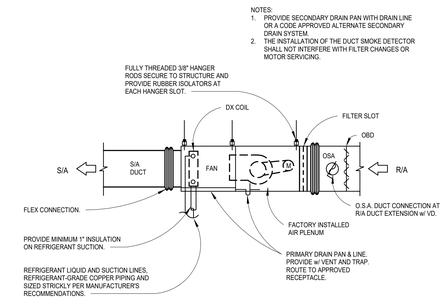
4 ROOF MOUNTED EXHAUST FAN (DOWNBLAST)
SCALE: NONE



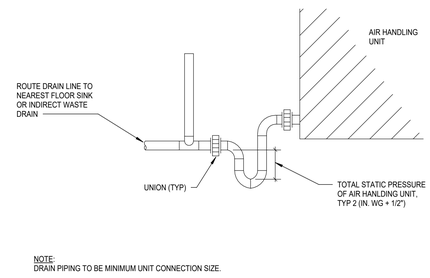
5 GOOSENECK OSA INTAKE DUCT
SCALE: NONE



6 INLINE EXHAUST FAN DETAIL
SCALE: NONE



7 FAN COIL MOUNTING DETAIL
SCALE: NONE



NOTE:
DRAIN PIPING TO BE MINIMUM UNIT CONNECTION SIZE.

8 CONDENSATE DRAIN
SCALE: NONE

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DFT: MJ / IF
DSN:MJ / IF
CHK:DEM

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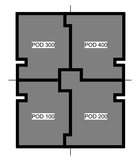

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MECHANICAL DETAILS

Scale: AS NOTED

M3.1

GENERAL NOTES

1. CONDUIT LAYOUTS SHOWN ON THE PLANS ARE DIAGRAMMATIC, NOT INDICATING THE EXACT ROUTING REQUIRED. THE CONTRACTOR SHALL ROUTE CONDUITS AS REQUIRED BY THE CONDITIONS OF INSTALLATION.
2. ALL EQUIPMENT PROVIDED BY THE ELECTRICAL CONTRACTOR SHALL BE NEW, LISTED AND LABELED BY A NATIONALLY-RECOGNIZED TESTING AGENCY, ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION, FOR THE CONDITIONS OF INSTALLATION. NO "RE-FURBISHED" EQUIPMENT IS ACCEPTABLE WITHOUT WRITTEN CONSENT BY ENGINEER OF RECORD.
3. DEVICE LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. EXACT DEVICE LOCATIONS SHALL BE AS INDICATED ON THE ARCHITECTURAL PLANS OR AS DIMENSIONED. IF NOT SHOWN ON THE ARCHITECTURAL PLANS OR DIMENSIONED ON THE ELECTRICAL PLANS, VERIFY EXACT LOCATION WITH THE ARCHITECT PRIOR TO ROUGH-IN.
4. ALL WIRE COUNTS ARE TYPICALLY NOT SHOWN BETWEEN LIGHT FIXTURES OR RECEPTACLES. PROVIDE ALL REQUIRED EVEN WHERE NOT SHOWN.
5. WHERE SIZE IS NOT SHOWN ON THE DRAWINGS, CIRCUITS SHALL CONSIST OF #12 PHASE AND GROUNDED (NEUTRAL CONDUCTORS) AND A #12 CU GROUND IN A CONDUIT. MC CABLE SHALL BE ACCEPTABLE IN WALLS. ALL BRANCH CIRCUIT HOME-RUNS SHALL BE IN CONDUIT. ALL WIRE SHALL BE COPPER.
6. UNLESS SPECIFICALLY NOTED OTHERWISE, THE ELECTRICAL CONTRACTOR SHALL MAKE FINAL CONNECTIONS TO ALL UTILIZATION EQUIPMENT SHOWN ON THE DRAWINGS. VERIFY THE TYPE OF FINAL CONNECTION AND PROVIDE APPROPRIATE WIRING METHOD.
7. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE MECHANICAL, PLUMBING AND GENERAL CONTRACTORS, PRIOR TO ORDERING OR INSTALLATION OF ANY EQUIPMENT, MECHANICAL AND PLUMBING EQUIPMENT REQUIREMENTS ARE PROVIDED IN THE ELECTRICAL DESIGN. THE CONTRACTOR WILL NOT BE COMPENSATED FOR COSTS ASSOCIATED WITH CHANGING THE ELECTRICAL SYSTEMS TO MATCH UTILIZATION EQUIPMENT, EVEN IF THE ELECTRICAL WORK IS INSTALLED PER THE ELECTRICAL DRAWINGS.
8. INSULATION & WIRE TYPES SHALL BE AS FOLLOWS : (UNLESS NOTED OTHERWISE)
   A. FEEDERS -
      1. ABOVE GRADE - THW/THWN, CU/AL, IN RACEWAY
      2. BELOW GRADE - THWN, CU/AL, IN RACEWAY
   C. BRANCH CIRCUITS - THHN/THWN, CU/AL, IN RACEWAY
9. SOME CONDUCTOR SIZES ARE BASED ON THE USE OF 75 DEGREE C CONDUCTOR RATINGS. THE CONTRACTOR SHALL VERIFY, PRIOR TO INSTALLATION OF CONDUCTORS OR CONDUIT FEEDING ANY EQUIPMENT, THAT ALL ELECTRICAL EQUIPMENT IS RATED FOR USE WITH 75 DEGREE C WIRING. IF ANY EQUIPMENT IS RATED FOR USE WITH LESS THAN 75 DEGREE C CONDUCTORS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY FOR EVALUATION/CORRECTION.
10. UNLESS SPECIFICALLY NOTED OTHERWISE, SYSTEMS PROVIDED OR INSTALLED BY THE ELECTRICAL CONTRACTOR FOR THE PROPER OPERATION OF THE EQUIPMENT OR SYSTEM, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE PROJECT.
11. THE CONTRACTOR SHALL PERFORM ALL ACCEPTANCE TESTS REQUIRED OR RECOMMENDED BY EQUIPMENT MANUFACTURERS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER SEVEN (7) DAYS PRIOR TO TESTING AND SHALL ALLOW OBSERVATION OF THE TESTING BY THE ENGINEER.
12. ALL RECEPTACLES INSTALLED WITHIN 6 FEET OF A SINK SHALL BE GFI PROTECTED.
13. UNLESS OTHERWISE NOTED, ALL EQUIPMENT DISCONNECTS SHALL BE NEMA TYPE 3R, FUSIBLE, 30A, 3 POLE. FUSE PER EQUIPMENT MANUFACTURER'S INSTALLATION INSTRUCTIONS.
14. DEVICE BOXES SHOWN BACK-TO-BACK SHALL BE OFFSET A MINIMUM OF TWELVE (12) INCHES TO REDUCE SOUND TRANSMISSION BETWEEN ROOMS.
15. ALL PENETRATIONS IN WALLS SHALL BE SEALED WITH FLEXIBLE ACOUSTIC CAULKING. CAULKING SHALL BE APPLIED AROUND OUTLET BOXES TO PROVIDE A COMPLETE SEAL BETWEEN THE BOX AND THE WALL.
16. PRIOR TO CORE DRILLING IN ANY FLOOR, ELECTRICAL CONTRACTOR SHALL COORDINATE WITH STRUCTURAL ENGINEER. PROVIDE ANY AND ALL TESTING REQUIRED PER STRUCTURAL ENGINEER.
17. PRIOR TO TRENCHING IN ANY AREA, THE CONTRACTOR SHALL CONTACT ELECTRICAL, COMMUNICATIONS/DATA, CABLE TV, GAS, AND WATER UTILITY PROVIDERS (BLUE STAKE) AND HAVE ALL UTILITIES IN THE AREA IDENTIFIED. IN ADDITION, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUBCONTRACTOR SPECIALIZING IN THE LOCATION OF UNDERGROUND STRUCTURES TO IDENTIFY ANY OBSTACLES IN THE PATH OF TRENCHING (PRIOR TO COMMENCING WORK). DAMAGE TO ANY UNDERGROUND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE PROJECT.
18. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH LOCAL AND STATE CODES INCLUDING THE NEC
19. ALL CABLE EXPOSED IN MECHANICAL AIR HANDLING PLENUM AREAS SHALL BE PLENUM RATED.
20. OVER CURRENT DEVICES SHALL BE LOCATED WHERE THEY WILL NOT BE EXPOSED TO PHYSICAL DAMAGE.
21. CONTRACTOR SHALL INSTALL CITY APPROVED HANDLE TIES FOR ALL SHARED NEUTRAL CIRCUITS.
22. CONTRACTOR SHALL CONTACT ENGINEER IN WRITING (RFI) PRIOR TO PROCEEDING WITH ANY WORK NOT CLEARLY SHOWN ON THESE CONTRACT DOCUMENTS. ENGINEER WILL NOT ACCEPT ANY RESPONSIBILITY FOR WORK HE HAS NOT EXPLICITLY AUTHORIZED.
23. PROVIDE IDENTIFICATION AT THE DISTRIBUTION PANEL FOR BRANCH CIRCUITS THAT FEED EMERGENCY LIGHTING UNIT EQUIPMENT.
24. ELECTRICAL EQUIPMENT THAT IS LIKELY TO REQUIRE MAINTENANCE WHILE ENERGIZED SHALL BE PROPERLY MARKED TO WARN PERSONNEL OF ARC FLASH HAZARD.
25. IN EVENT OF A DISCREPANCY BETWEEN THE SPECIFICATIONS AND A NOTE ON THE DRAWINGS, THE DRAWING NOTES SHALL SUPERSEDE THE SPECIFICATIONS.
26. PROVIDE A #18 OR LARGER COPPER TRACER WIRE SECURELY ATTACHED TO THE NON-METALLIC CABLE, PIPE OR CONDUIT AT 8'-0" ON CENTER. IT SHALL HAVE A 12" OF TRACER WIRE ACCESSIBLE ABOVE GRADE AT ANY ABOVE GRADE TERMINATION PER ARIZONA STATE STATUTE.
27. LIGHT FIXTURES IN SUSPENDED CEILINGS SHALL BE INSTALLED IN COMPLIANCE WITH BUILDING CODE. REQUIREMENTS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
    a. LIGHT FIXTURES SHALL BE POSITIVELY ATTACHED TO THE SUSPENDED CEILING SYSTEM.
    b. INSTALL (OR VERIFY THE EXISTENCE OF) A #12 GAGE HANGER WIRE WITHIN 3" OF EACH CORNER OF THE LIGHT FIXTURE.
    c. PENDANT-HUNG FIXTURES SHALL BE SUPPORTED FROM THE STRUCTURE ABOVE WITH (2) #9 GAGE WIRES OR OTHER APPROVED SUPPORT METHOD WHICH DOES NOT DEPEND ON THE CEILING SUPPORT SYSTEM.
28. WHERE THE PLANS INDICATE A LIGHT FIXTURE IS TO BE PROVIDED WITH SPECIAL FEATURES/SWITCHING (DIMMING, EMERGENCY, THREE-LEVEL, ETC) THE CONTRACTOR SHALL PROVIDE THESE FIXTURES WITH THE APPROPRIATE BALLASTING TO ACCOMMODATE THE SPECIAL FEATURE. THE CONTRACTOR SHALL PROVIDE THE FIXTURES AS INDICATED IN THE LIGHTING FIXTURE SCHEDULE, WITH MODIFICATIONS AS REQUIRED BY PLAN NOTES.
29. THE ELECTRICAL CONTRACTOR SHALL REVIEW THE MECHANICAL PLANS, PRIOR TO BID, AND DETERMINE THE LOCATION OF SMOKE OR FIRE/SMOKE DAMPERS. IF ANY. UNLESS OTHERWISE NOTED ON THE ELECTRICAL PLANS, EACH SMOKE OR FIRE/SMOKE DAMPER SHALL BE CONNECTED TO THE NEAREST RECEPTACLE CIRCUIT, NOT TO EXCEED THREE (3) DAMPERS ADDED TO ANY CIRCUIT. INCLUDE IN THE BASE BID BID ONE (1) DUCT SMOKE DETECTOR PER SMOKE OR FIRE/SMOKE DAMPER SHOWN ON THE MECHANICAL PLANS.
30. UNLESS NOTED OTHERWISE, EACH DAMPER DUCT SMOKE DETECTOR SHALL BE RATED 24VAC AND SHALL BE CONNECTED TO THE FIRE ALARM PANEL (IF ANY) ON A SEPARATE ZONE.
31. SMOKE OR FIRE/SMOKE DAMPERS SHALL BE CONNECTED TO THE FIRE ALARM SYSTEM (IF ANY) AND SHALL BE CONTROLLED BY THE FIRE ALARM CONTROL PANEL (IF ANY).
32. THE ELECTRICAL CONTRACTOR SHALL REVIEW THE MECHANICAL PLANS, PRIOR TO BID, TO DETERMINE THE NUMBER AND LOCATION OF HVAC SYSTEMS RATED 2000 CFM OR HIGHER. THE ELECTRICAL CONTRACTOR SHALL INCLUDE, IN THE BASE BID, A DUCT SMOKE DETECTOR ON EACH UNIT FOR ALL SYSTEMS RATED 2000 CFM OR HIGHER. THE DETECTORS SHALL BE RATED 120VAC. PROVIDE THE DETECTORS TO THE MECHANICAL CONTRACTOR OR INSTALLATION IN THE DUCT. MECHANICAL CONTRACTOR SHALL CONNECT EACH DETECTOR TO SHUT DOWN IT'S ASSOCIATED UNIT. ELECTRICAL CONTRACTOR SHALL MAKE CONNECTION TO THE FIRE ALARM CONTROL PANEL (IF ANY) ON A SEPARATE ZONE. NOTE THAT CERTAIN MUNICIPALITIES REQUIRE SMOKE DETECTORS ON BOTH THE SUPPLY AND RETURN DUCTS. SEE THE DRAWINGS TO DETERMINE IF THIS PROJECT REQUIRES THE EXTRA DETECTOR.
33. DEMOLITION NOTES:
    a. FOR EQUIPMENT BEING REMOVED AND REPLACED, THE CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING-OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.
    b. WHERE EQUIPMENT IS BEING REMOVED, BUT NOT REPLACED, REMOVE THE CONDUCTORS FEEDING THE EQUIPMENT BACK TO THE POINT WHERE THEY RECEIVE POWER (CIRCUIT BREAKER OR BRANCH CIRCUIT TAP). REMOVE ACCESSIBLE CONDUITS. ABANDON IN-PLACE INACCESSIBLE CONDUITS. AFTER REMOVAL OF EQUIPMENT, REPAIR ANY OPENING LEFT TO MATCH SURROUNDING WALLS, CEILINGS, OR FLOORS TO THE OWNER'S SATISFACTION.
    c. COORDINATE WITH THE OTHER TRADES, PRIOR TO BID, AND INCLUDE IN THE BASE BID THE ELECTRICAL DISCONNECTION OF ANY EQUIPMENT BEING DEMOLISHED, EVEN IF NOT EXPLICITLY IDENTIFIED IN THE ELECTRICAL PLANS.
    d. UNLESS NOTED OTHERWISE, REMOVE ALL DEMOLISHED EQUIPMENT FROM THE PROPERTY AND DISPOSE OF IT PROPERLY (IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL ENVIRONMENTAL REGULATIONS). FEES ASSOCIATED WITH DISPOSAL SHALL BE INCLUDED IN THE CONTRACTOR'S BASE BID.
34. PRIOR TO ORDERING ANY MATERIALS THE CONTRACTOR SHALL BE REQUIRED TO COMPARE THE ONE-LINE DIAGRAM WITH THE PANEL SCHEDULES TO ENSURE EVERYTHING IS COORDINATED. REPORT ANY DISCREPENCIES TO THE ENGINEER OF RECORD. IF THESE ARE FOUND AND NOT REPORTED THEN THE CONTRACTOR PROCEEDS AT HIS OWN COST/RISK.
35. E.C. SHALL COORDINATE THE EXACT EXIT SIGN LOCATION/PLACEMENT WITH THE FIELD BUILDING INSPECTOR PRIOR TO ROUGH INSPECTION APPROVAL.
36. PROVIDE CONCRETE/STEEL BOLLARD PROTECTION FOR ALL ELECTRICAL EQUIPMENT SUBJECT TO DAMAGE IN TRAFFIC AREAS. COORDINATE WITH ARCHITECT FOR DETAIL AND LOCATION.
37. COORDINATION OF OVERCURRENT PROTECTIVE DEVICES SHALL BE BY ELECTRICAL CONTRACTOR INCLUDING SETTINGS OF CIRCUIT BREAKERS, FUSES AND GROUND FAULT DEVICES. CONTRACTOR SHALL PROVIDE COORDINATION STUDY AND SET ALL CIRCUIT PROTECTIVE DEVICE SETTINGS AS RECOMMENDED AT THE COMPLETION OF THE PROJECT.
38. EMERGENCY SYSTEMS OVERCURRENT DEVICES SHALL BE SELECTIVELY COORDINATED WITH ALL SUPPLY SIDE OVERCURRENT PROTECTIVE DEVICES. IN ACCORDANCE WITH NEC 700, 701 AND 620 REQUIREMENTS.
39. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR SUPPLYING AND INSTALLING ALL LOW VOLTAGE WIRING BETWEEN LIGHT FIXTURES AND DIMMING/SWITCHING MODULES AND/OR LIGHTING CONTROL PANELS FOR A FULLY FUNCTIONING SYSTEM. REFER TO MANUFACTURERS INSTALLATION DETAILS FOR REQUIREMENTS.
40. USE OF TYPE NM, NMC, AND NMS (ROMEX) CABLES ON THIS PROJECT IS PROHIBITED.

E - ELECTRICAL SHEET LIST

SHEET NUMBER	SHEET NAME
E0.1	ELECTRICAL GENERAL NOTES/ SHEET INDEX
E0.2	ELECTRICAL SYMBOLS
E1.1	ELECTRICAL SITE PLAN
E1.2	ELECTRICAL SITE PHOTOMETRIC
E2.1	LIGHTING PLAN - LEVEL 1
E2.2	LIGHT FIXTURES CUT SHEETS
E2.3	LIGHTING CONTROLS DIAGRAMS/ SCHEDULES
E3.1	POWER PLAN - LEVEL 1
E3.2	HVAC MEZZANINE POWER PLAN
E4.1	SINGLE-LINE DIAGRAM/CALCS
E6.1	PANELBOARD SCHEDULES
E6.2	PANELBOARD SCHEDULES
E7.1	LIGHTING COMCHECK

Grand total: 13

E - ABBREVIATIONS

A	AMPS/AMPERES
AFC	AVAILABLE FAULT CURRENT
AFCI	ARC FAULT CIRCUIT INTERRUPTER
AFF	ABOVE FINISHED FLOOR.
AFG	ABOVE FINAL GRADE.
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CU	COPPER MATERIAL
DED	DEDICATED
EF	EXHAUST FAN
EM	EMERGENCY / 90 MINUTE BATTERY FOR EGRESS
EMT	ELECTRICAL METALLIC TUBING
ENT	ELECTRICAL NON-METALLIC TUBING
ER	EXISTING TO BE RELOCATED AS INDICATED.
EX	EXISTING TO REMAIN.
FMC	FLEXIBLE METAL CONDUIT
GEC	GROUNDING ELECTRODE CONDUCTOR AT THE SES
GFCI	GROUND FAULT CURRENT INTERRUPTER.
GND	GROUND
IMC	INTERMEDIATE METAL CONDUIT
IG	ISOLATED GROUND
KCMIL	1000 CIRCULAR MILS (MCM)
LFMC	LIQUID-TIGHT FLEXIBLE METAL CONDUIT
LFNC	LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT
N	NEW
N1	NEMA 1
N3R	NEMA 3R
NL	NIGHT LIGHT. BYPASS LOCAL SWITCHING.
RNC	RIGID NONMETALLIC CONDUIT
UNO	UNLESS NOTED OTHERWISE.
WP	WEATHERPROOF
XP	EXPLOSION PROOF.
XR	EXISTING TO BE REMOVED.

E - CODE REFERENCE

JEFFERSON COUNTY, TEXAS	
2020	NEC
2021	IECC

TEXAS ENGINEER FIRM REGISTRATION #F-15201

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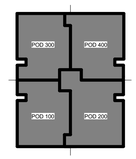

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ELECTRICAL GENERAL NOTES/ SHEET INDEX

Scale: AS NOTED

E0.1

ELECTRICAL SYMBOLS

(NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT)

LIGHTING

- 2 A b — 2' X 4' LUMINAIRE. UPPER CASE LETTER INDICATES TYPE AS INDICATED ON THE LUMINAIRE SCHEDULE. NUMBER INDICATES THE CIRCUIT FEEDING THE FIXTURE, LOWER CASE LETTER INDICATES THE SWITCH CONTROLLING THE FIXTURE (NOTATION IS TYPICAL FOR ALL LIGHT FIXTURES)
- STRIP FIXTURE, LENGTH PER PLAN
- NOMINAL 1' X 4' RECESSED CEILING-MOUNTED LUMINAIRE
- SURFACE WALL-MOUNTED LIGHT FIXTURE
- RECESSED CEILING-MOUNTED FIXTURE
- SURFACE CEILING MOUNTED FIXTURE
- SOLID 'JBOX' ON ANY FIXTURE INDICATES A FIXTURE WITH AN INTEGRAL EMERGENCY POWER SUPPLY, PER THE SPECIFICATIONS
- CEILING MOUNTED EMERGENCY EXIT SIGN. ARROWS INDICATE PATH OF EGRESS (TYPICAL FOR ALL EXIT SIGNS)
- WALL MOUNTED EMERGENCY EXIT SIGN
- BOLLARD - TYPE LIGHT FIXTURE
- POLE-MOUNTED LIGHT FIXTURE

SWITCHES

- $ — SINGLE POLE TOGGLE SWITCH
- $2 — SINGLE POLE TOGGLE SWITCH
- $3 — THREE-WAY TOGGLE SWITCH
- $OS — OCCUPANCY SENSOR
- PROGRAMMABLE TIMESWITCH
- PC — PHOTOCELL, ON ROOF FACING NORTH UNLESS NOTED OTHERWISE

DEVICES

- DUPLEX CONVENIENCE RECEPTACLE, +18" U.N.O.
- "CROSS SLASH" ON ANY RECEPTACLE INDICATES INTERGRAL GROUND FAULT PROTECTION (GFCI)
- DOUBLE DUPLEX (FOURPLEX) CONVENIENCE RECEPTACLE, +18" U.N.O.
- SINGLE CONVENIENCE RECEPTACLE, +18" U.N.O.
- DUPLEX CONVENIENCE RECEPTACLE MOUNTED ABOVE COUNTER AT + 44" OR AS SPECIFIED ON ARCHITECT'S ELEVATIONS
- INTEGRAL GROUND FAULT PROTECTION DUPLEX CONVENIENCE RECEPTACLE MOUNTED ABOVE COUNTER AT +44" OR AS SPECIFIED ON ARCHITECT'S ELEVATIONS
- DOUBLE DUPLEX (FOURPLEX) CONVENIENCE RECEPTACLE MOUNTED ABOVE COUNTER AT +44" OR AS SPECIFIED BY ARCHITECTS ELEVATIONS
- SPLIT WIRED DUPLEX CONVENIENCE RECEPTACLE, +18" U.N.O.
- DUPLEX CONVENIENCE RECEPTACLE WITH AN ISOLATED GROUND CONNECTION
- SPECIAL PURPOSE RECEPTACLE AS NOTED ON DRAWINGS (250 VOLT). NEMA CONFIGURATION AS INDICATED ON THE PLANS OR AS REQUIRED BY THE EQUIPMENT
- J C F — JUNCTION BOX. 'C' INDICATES CEILING MOUNTED. 'F' INDICATES FLOOR MOUNTED (SUBSCRIPTS ARE TYPICAL FOR ALL DEVICES)

SPECIAL SYSTEMS

- VOICE OUTLET
- DATA OUTLET
- COMBINATION TELEPHONE AND DATA OUTLET IN THE SAME BOX
- TELEVISION OUTLET
- CLOCK OUTLET
- S — CEILING MOUNTED SPEAKER
- S — CEILING MOUNTED SPEAKER
- M — MICROPHONE OUTLET
- I — INTERCOM
- B — BELL BUZZER
- C — CHIME, SEE DRAWINGS FOR SPECIFICATIONS
- PUSSBUTTON. SEE DRAWINGS FOR SPECIFICATIONS
- CR — CARD READER WITH BACK BOX FOR CONDUIT/WIRE ACCESS ROUTING
- CAMERA WITH BACK BOX FOR CONDUIT/WIRE ACCESS ROUTING

POWER

- $M — HORSEPOWER RATED MANUAL MOTOR SWITCH
- LIGHTING CONTACTOR IN SURFACE-MOUNTED ENCLOSURE
- LIGHTING CONTACTOR IN FLUSH-MOUNTED ENCLOSURE
- COMBINATION MOTOR CONTROLLED PROVIDED BY EQUIPMENT VENDOR, INSTALLED BY ELECTRICAL CONTRACTOR
- COMBINATION MOTOR CONTROLLED PROVIDED AND INSTALLED BY ELECTRICAL CONTRACTOR
- FUSIBLE DISCONNECT SWITCH FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE. SIZE AND FUSES AS PER RECOMMENDATIONS OF EQUIPMENT'S MANUFACTURER OR AS NOTED. 30A, 3P, 250V, NEMA 3R UNLESS NOTED OTHERWISE. (N. INDICATES NON-FUSED)
- ELECTRICAL MOTOR. SEE DRAWINGS FOR SIZE
- DISTRIBUTION PANELBOARD, MOTOR CONTROL CENTER OR SERVICE ENTRANCE SECTION. SEE DRAWINGS FOR EXACT TYPE
- T — DISTRIBUTION TRANSFORMER
- SURFACE MOUNTED PANEL BOARD
- FLUSH MOUNTED PANEL BOARD
- CABINET
- TMB — TELEPHONE MOUNTING BOARD

WIRE/ CONDUIT

- FLEXIBLE CONDUIT
- CONDUIT CONCEALED IN WALLS OR ABOVE CEILING W/ 2 #12, #12 GND., 3/4" C., UNLESS NOTED OTHERWISE
- CONDUIT ROUTED UNDER FLOOR OR BELOW GRADE W/ 2 #12, #12 GRD., 3/4" C., UNLESS NOTED OTHERWISE
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- INDICATES A 'HOME-RUN' TO THE PANELBOARD
- INDICATES A PHASE CONDUCTOR
- INDICATES A GROUNDED (NEUTRAL) CONDUCTOR
- INDICATES AN EQUIPMENT GROUNDING CONDUCTOR
- INDICATES AN ISOLATED GROUND CONDUCTOR (SAME SIZE AS EQUIPMENT GROUNDING CONDUCTOR)
- # — INDICATES THE CIRCUIT FEEDING THE RACEWAY OR TRACK IN THE DIRECTION OF THE ARROW

SINGLE-LINE DIAGRAM

- CIRCUIT BREAKER, FIXED MOUNTED
- CIRCUIT BREAKER, DRAWOUT MOUNTING
- FUSIBLE SWITCH. SIZE AS INDICATED ON DRAWINGS
- TRANSFORMER. SEE ONE-LINE FOR TYPE AND SPECIFICATION
- CURRENT TRANSFORMER
- M — METERING DEVICE
- PANELBOARD, MAIN LUG ONLY, CU BUSS
- PANELBOARD, MAIN CIRCUIT BREAKER, CU BUSS
- TRANSFER SWITCH - MANUAL OR AUTOMATIC
- F/T — INDICATES A FEED-THROUGH LUG CONNECTION
- G — GENERATOR WITH INTEGRAL PROTECTION

FIRE ALARM

- F — FIRE ALARM SPEAKER/ STROBE
- F — FIRE ALARM MANUAL PULL STATION
- F — FIRE ALARM HORN/ STROBE
- F — FIRE ALARM STROBE ONLY
- FACP — FIRE ALARM CONTROL PANEL
- FAAP — FIRE ALARM ANNUNCIATOR PANEL
- H — HEAT DETECTOR. # INDICATES FIXED TEMPERATURE SETTING IF DIFFERENT THAN NOTED IN SPECIFICATIONS
- S — SMOKE DETECTOR
- D — DUCT MOUNTED SMOKE DETECTOR. SUPPLIED BY E.C., INSTALLED BY M.C.
- SMOKE/ FIRE DAMPER FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR. WIRED BY ELECTRICAL CONTRACTOR
- T — FIRE SPRINKLER TAMPER SWITCH
- F — FIRE SPRINKLER FLOW SWITCH
- MAGNETIC DOOR RELEASE
- R — CONTROL RELAY, 10.0 AMPS, DP/ DT IN NEMA 1 ENCLOSURE
- C — FIRE ALARM CONTROL MODULE

LIGHTING SYSTEM FUNCTIONAL TESTING

AN APPROVED INDEPENDENT 3RD PARTY COMPANY (INDEPENDENT FROM THE ELECTRICAL DESIGN FIRM AND ANY OF THE CONSTRUCTION COMPANY'S INVOLVED WITH THIS PROJECT) SHALL BE RESPONSIBLE FOR THE FUNCTIONAL TESTING OF THE LIGHTING SYSTEM AND SHALL PROVIDE DOCUMENTATION TO THE BUILDING OFFICIAL CERTIFYING THAT THE INSTALLED LIGHTING CONTROLS MEET THE PROVISIONS OF THE IECC C405. (THE GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING THIS SERVICE AS PART OF HIS PROJECT "PROPER COMPLETION RESPONSIBILITIES".)

WHERE OCCUPANCY SENSORS, TIME SWITCHES, PROGRAMMABLE SCHEDULE CONTROLS, PHOTO SENSORS OR DAYLIGHTING CONTROLS ARE INSTALLED, THE FOLLOWING PROCEDURES SHALL BE PERFORMED:

1. CONFIRM THAT THE PLACEMENT, SENSITIVITY, AND TIME-OUT ADJUSTMENTS FOR OCCUPANT SENSORS YIELD ACCEPTABLE PERFORMANCE.
2. CONFIRM THAT THE TIME SWITCHES AND PROGRAMMABLE SCHEDULE CONTROLS ARE PROGRAMMED TO TURN THE LIGHTS OFF.
3. CONFIRM THAT THE PLACEMENT AND SENSITIVITY ADJUSTMENTS FOR PHOTO SENSOR CONTROLS REDUCE ELECTRIC LIGHT BASED ON THE AMOUNT OF USABLE DAYLIGHT IN THE SPACE AS SPECIFIED.

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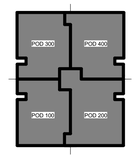

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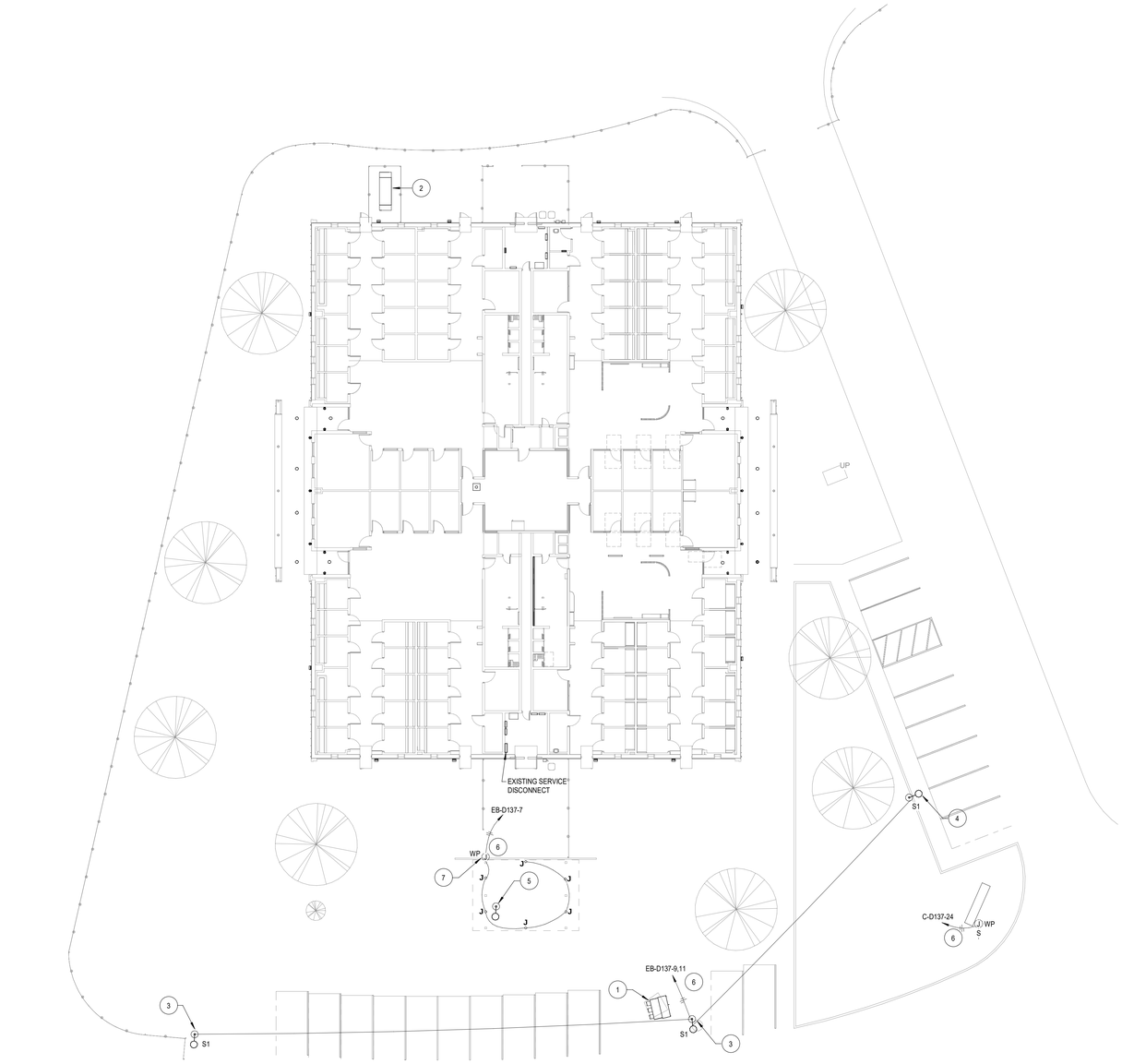
ELECTRICAL SYMBOLS

Scale: AS NOTED

E0.2



7 ELECTRICAL SITE PLAN
SCALE: 1/16" = 1'-0"

GENERAL NOTES

A THIS ELECTRICAL UTILITIES SITE PLAN IS FOR REFERENCE ONLY. NO CONSTRUCTION IS TO BEGIN UNTIL FINAL UTILITY COMPANY PLANS ARE RECEIVED. UTILITY COMPANY DESIGN IS NOT AVAILABLE AT THIS TIME. ADDITIONAL WORK WILL BE REQUIRED.

B ALL WORK SHALL BE PER UTILITY COMPANY CONSTRUCTION STANDARDS AND SPECIFICATIONS. PROVIDE CONDUIT SPACERS THROUGHOUT AND CONCRETE ENCASEMENT WHERE FEEDERS PASS UNDER DRIVEWAYS AND OR PARKING LOTS.

C ALL TRANSFORMER BOXES, METER PANELS, ELECTRICAL EQUIPMENT AND MISCELLANEOUS UTILITY EQUIPMENT SHALL BE PAINTED TO MATCH ADJACENT BUILDING COLORS WHERE SCREENING IS NOT APPLICABLE. COORDINATE WITH UTILITY PRIOR TO PAINTING.

D SEE SHEET E0.1 GENERAL NOTES FOR ADDITIONAL UTILITY COORDINATION NOTES.

E ALL EXTERNAL LIGHTING SHALL BE LOCATED AND DESIGNED TO PREVENT RAYS FROM BEING DIRECTED OFF OF THE PROPERTY UPON WHICH THE LIGHTING IS LOCATED.

F THE CONTRACTOR SHALL PROGRAM THE LIGHTING CONTROLLER AS PER THE LIGHTING DIAGRAM PRIOR TO CALLING THE CITY FOR THE INSPECTION.

G THE CONTRACTOR IS TO SCHEDULE A NIGHT TIME INSPECTION OF THE ENERGIZED LIGHTING, TO ATTEND THIS INSPECTION AND TO CORRECT ALL ITEMS IDENTIFIED DURING INSPECTION PRIOR TO ISSUING THE FINAL CERTIFICATE OF OCCUPANCY.

KEYED NOTES

1 EIXSTING LOCATION OF PAD MOUNT UTILITY TRANSFORMER. MAINTAIN MINIMUM CLEARANCE IN FRONT, SIDES AND BACK OF UTILITY TRANSFORMER PER UTILITY REQUIREMENTS.

2 EIXSTING 60KW NATURAL GAS GENERATOR TO BE REPLACED WITH NEW GENERATOR, ALL EXISTING CONDUIT AND CONDUCTORS TO BE REMOVED AND DISPOSED OF IN A PROPER MANNER. SEE ONE-LINE DIAGRAM AND SPECIFICATIONS FOR DETAILS.

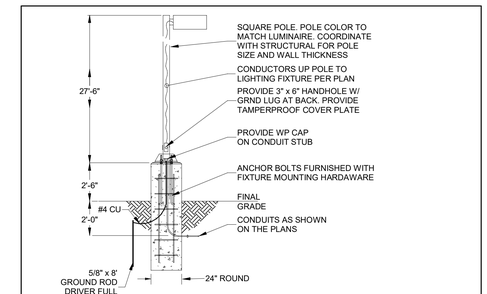
3 EIXSTING METAL HALIDE FIXTURE ON EIXSTING SQUARE STEEL SITE POLE TO HAVE NEW LED HEAD INSTALLED ON EXISTING POLE. SEE LUMINAIRE SCHEDULE FOR FIXTURE HEAD DETAILS.

4 NEW LED POLE LIGHT WITH NEW POLE BASE PER DETAIL THIS SHEET. SEE LUMINAIRE SCHEDULE FOR FIXTURE DETAILS.

5 EXISTING POLE LIGHT TO BE REMOVED. CAP AT GRADE.

6 ROUTE LIGHTING HOME RUN THROUGH CONTACTOR PANEL AND TIME CLOCK FOR CONTROL.

7 ROUTE LIGTING CIRCUIT IN 1/2" CONDUIT THROUGH STRUCTURE TO LIGHTS IN CANOPY.



NOTE: THE POLE MANUFACTURER SHALL PROVIDE A POLE BASE DESIGN FOR 130MPH WIND LOADING WITH A 1.3 GUST FACTOR. THE POLE BASE DESIGN SHALL BE FROM A STRUCTURAL ENGINEER REGISTERED IN THE STATE OF TEXAS. THE STRUCTURAL ENGINEER SHALL VERIFY THE WIND LOADING AND GUST FACTOR CRITERIA ABOVE ARE ADEQUATE FOR THE AREA OF INSTALLATION

1 POLE MOUNTED DETAIL NTS

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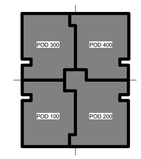

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ELECTRICAL SITE PLAN

Scale: AS NOTED

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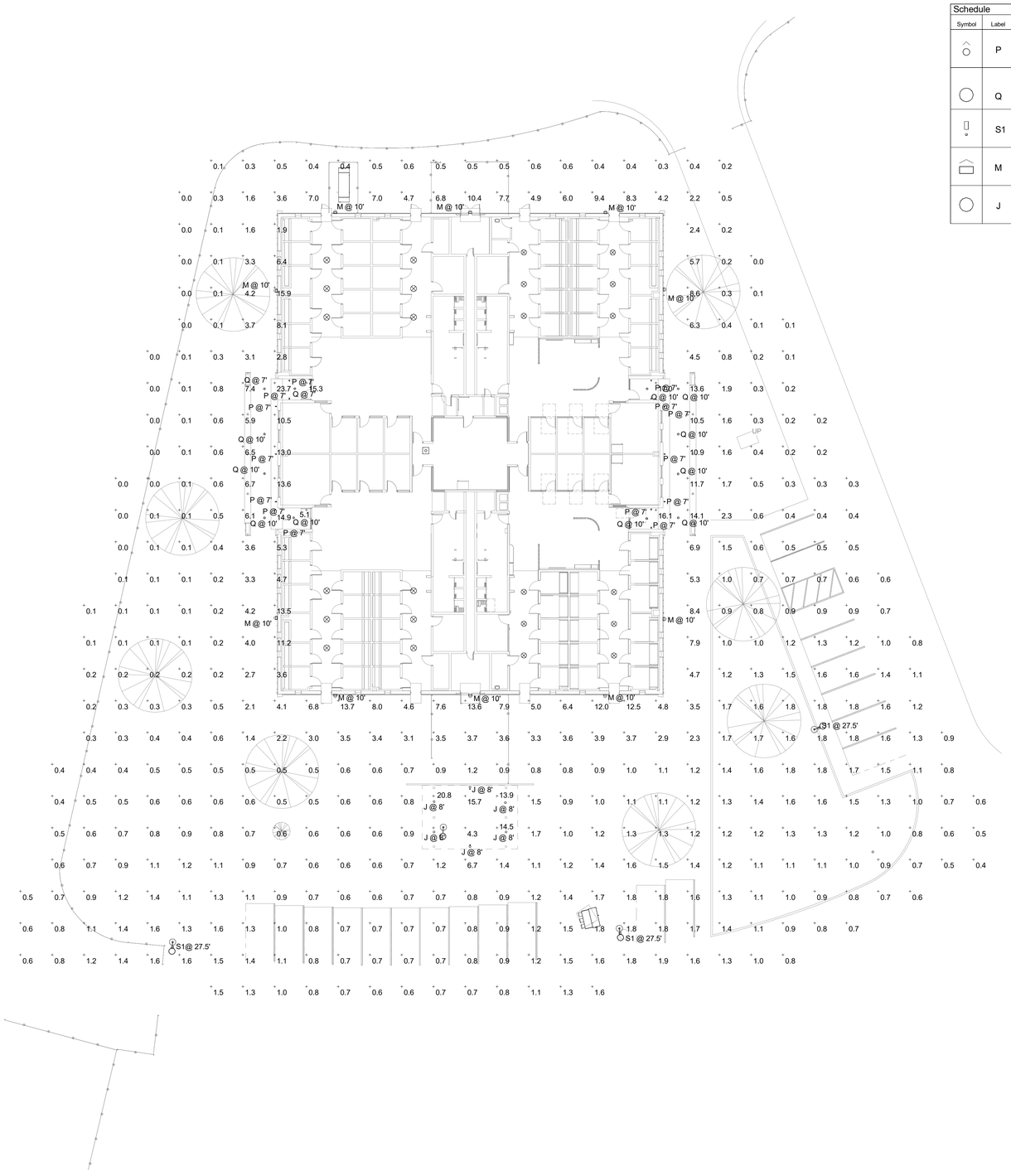

1 ELECTRICAL SITE PHOTOMETRIC
SCALE: 1/16" = 1'-0"

Statistics						
Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Overall Site	+	2.2 fc	23.7 fc	0.0 fc	N/A	N/A

Schedule									
Symbol	Label	QTY	Manufacturer	Catalog	Description	Number Lamps	Lamp Output	LLF	Input Power
	P	12	GARDCO	GBS-A01-740-T3M	Geoform Wall Sconce - block, 20 LED's, 4000K CCT, TYPE T3M OPTIC, 70CRI	1	1756	0.95	10.2
	Q	12	THE KIRLIN COMPANY	LSV-12487-1500L-WFL	SPUN BLACK PAINTED METAL HOUSING,	1	1509	0.95	19
	S1	3	SIGNIFY CANADA LTD	OPF-S-A07-840-TSW	OptiForm - Small, 40 LED's, 4000K CCT, TYPE TSW OPTIC, 80CRI	1	18713	0.95	136.2
	M	10	Signify Stonco Keene	LPW-16-50-NW-G3-2-2021	LPW16, 16 LED's, 4000K CCT, TYPE 2 OPTIC,	1	5446	0.95	48
	J	6	HK Lighting Group Inc	ZXL20i_Fit-W	Area Accent Light	1	2667	0.95	29.02

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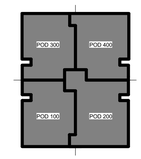

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ELECTRICAL SITE PHOTOMETRIC

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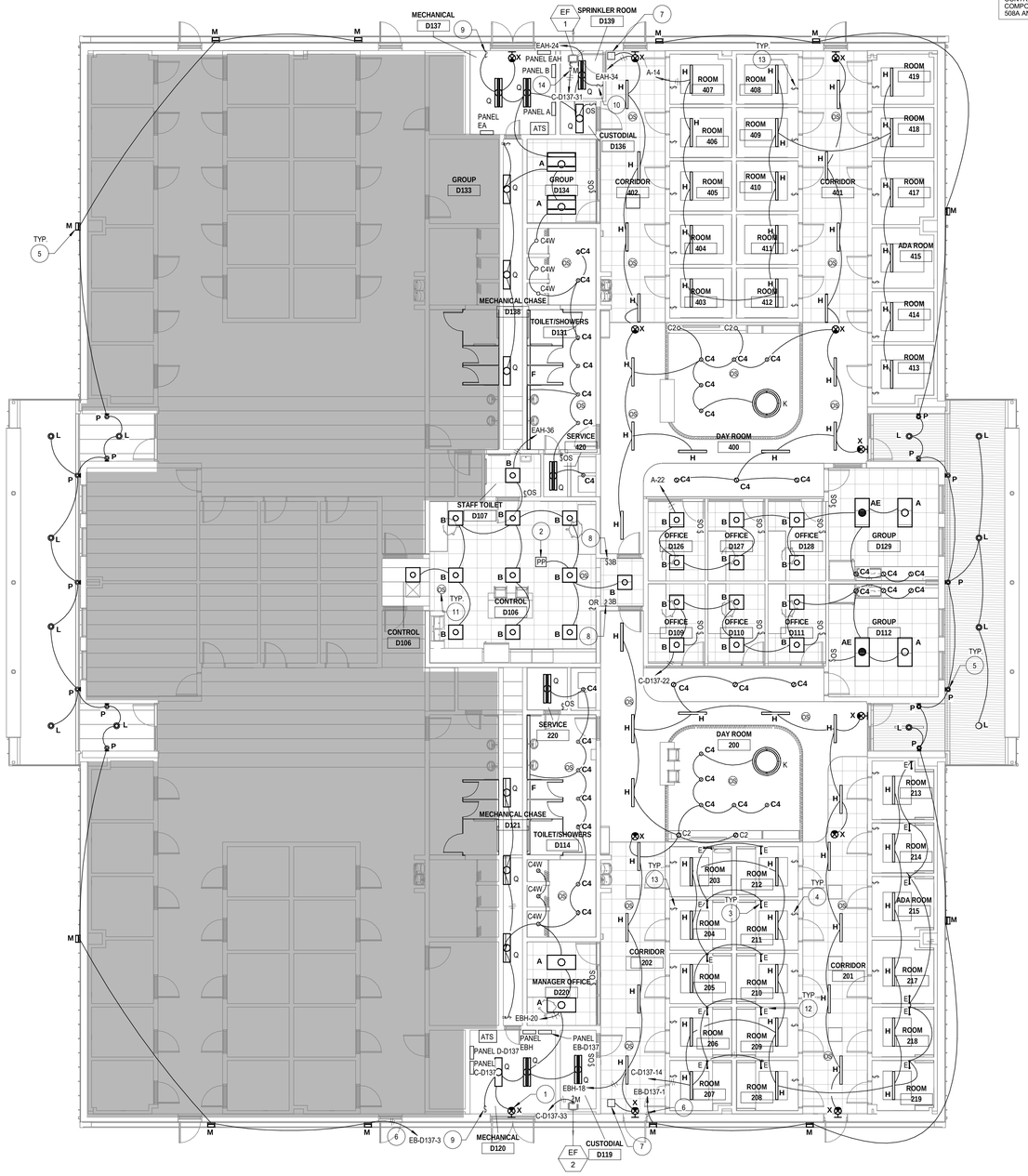

1 LIGHTING PLAN - LEVEL 1
SCALE: 1/8" = 1'-0"

CONTACTOR DIAGRAM

N.T.S.

NOTE:
CONTROL PANEL ASSEMBLY AND COMPONENTS SHALL COMPLY WITH UL 508A AND NEC 409.110 REQUIREMENTS.

GENERAL NOTES

A E.C. SHALL COORDINATE THE EXACT EXIT SIGN LOCATION/PLACEMENT WITH THE FIELD BUILDING INSPECTOR PRIOR TO ROUGH INSPECTION APPROVAL.

B PER 2021 IECC DAYLIGHT ZONES HAVE EITHER INDIVIDUAL LIGHTING CONTROLS INDEPENDENT FROM THAT OF THE GENERAL AREA LIGHTING THAT ARE EITHER MANUAL OR AUTOMATIC.

C PER 2021 IECC AUTOMATIC DAYLIGHT ZONE CONTROLS SHALL BE INSTALLED AND CAPABLE OF REDUCING POWER TO <15 PERCENT USING CONTINUOUS DIMMING BALLASTS AND DAYLIGHT-SENSING CONTROLS.

D PER 2021 IECC OCCUPANCY SENSORS SHALL BE REQUIRED IN THE FOLLOWING SPACES AND AUTOMATICALLY TURN LIGHTING OFF WITHIN 30 MINUTES OF ALL OCCUPANTS LEAVING THE SPACE: CLASSROOMS/LECTURE/TRAINING ROOMS, CONFERENCE/MEETING/MULTIPURPOSE ROOMS, COPY/PRINT ROOMS, LOUNGES, EMPLOYEE LUNCH AND BREAK ROOMS, PRIVATE OFFICES, STORAGE ROOMS, JANITORIAL CLOSEST, LOCKER ROOMS, AND OTHER SPACES <=300 SQUARE FEET THAT ARE ENCLOSED BY FLOOR-TO-CEILING HEIGHT PARTITIONS AND WAREHOUSES. AUTOMATIC-ON SENSORS SET POWER ON <50 PERCENT POWER.

E ALL TIME SWITCHES CONTROLLING EXTERIOR LIGHTING SHALL BE CAPABLE OF RETAINING PROGRAMMING AND THE TIME SETTING DURING LOSS OF POWER FOR A PERIOD OF AT LEAST 10 HOURS.

F REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR ALL FIXTURE LOCATIONS.

G ALL SURFACE MOUNTED CONDUIT SHALL BE ROUTED PERPENDICULAR AND PARALLEL TO BEAMS AND COLUMNS. ALL CONDUIT ROUTING SHALL BE COORDINATED WITH THE PROJECT MANAGER OR ARCHITECT PRIOR TO ROUGH-IN. PAINT ALL EXPOSED CONDUIT, BOXES AND FITTINGS AS REQUIRED BY ARCHITECT.

H ELECTRICAL CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR PLACEMENT OF FIXTURES PRIOR TO ROUGH-IN TO AVOID CONFLICT.

KEYED NOTES

1 PROVIDE UNSWITCHED "HOT" CIRCUIT AS SHOWN TO EMERGENCY FIXTURE.

2 PROVIDE POWER PACK/RELAY PER MANUFACTURE REQUIREMENTS. PROVIDE ALL NECESSARY COMPONENTS FOR A FULLY FUNCTION SYSTEM. REFER TO CONTROLS LEGEND ON THIS SHEET FOR POWER PACK/RELAY SELECTION. LOCATION SHOWN FOR INFORMATION ONLY, POWER PACK MUST BE LOCATED IN AN ACCESSIBLE LOCATION.

3 NEW DECORATIVE LIGHT ABOVE MILLWORK. REFER TO ARCHITECTURAL ELEVATION FOR MOUNTING HEIGHT. PROVIDE NEW JUNCTION BOX IN EXISTING BLOCK WALL.

4 EXISTING COMMUNICATION JUCTION BOX TO BE REMOVED. PROVIDE NEW JUNCTION BOX IN BLOCK WALL FOR NEW WALL MOUNTED LIGHT SWITCH IN SLEEPING UNITS.

5 COORDINATE MOUNTING HEIGHT OF FIXTURES WITH ARCHITECTURAL PLAN PRIOR TO INSTALLATION ROUGH-IN. (TYPICAL).

6 ROUTE LIGHTING HOME RUN THROUGH CONTACTOR AND TIME CLOCK FOR CONTROL.

7 LEGRAND ROOM CONTROLLER LMRC-211, 1 RELAY CONTROLLER, 0-10V DIMMING. INSTALL PER MANUFACTURE REQUIREMENTS. PROVIDE ALL NECESSARY COMPONENTS FOR A FULLY FUNCTION SYSTEM. LOCATION SHOWN FOR INFORMATION ONLY, ROOM CONTROLLER MUST BE LOCATED IN AN ACCESSIBLE LOCATION.

8 PROVIDE LEGRAND LMSW-103 3-BUTTON SWITCH FOR ON/OFF AND DIM UP AND DIM DOWN FINCTION LOCATED IN CONTROL ROOM PER PLAN. PROVIDE ALL NECESSARY COMPONENTS FOR A FULLY FUNCTION SYSTEM.

9 STANDARD LINE VOLTAGE WALL LIGHT SWITCH IN ELECTRICAL ROOM/PLUMBING CHASE.

10 STANDARD LINE VOLTAGE WALL LIGHT SWITCH IN FIRE RISER ROOM.

11 PROVIDE CEILING MOUNTED OCCUPANCY SENSOR PER 2018-IECC REQUIREMENT. REFER TO SPECIFICATION SHEET FOR SENSOR SELECTION.

12 LED WALL ARM LIGHT WITH INTEGRAL SWITCH, PROVIDE UNSWITCHED CIRCUIT TO LIGHT. VERIFY MOUNTING PROOR TO ROUGH-IN.

13 STANDARD LINE VOLTAGE WALL LIGHT SWITCH FOR CEILING LIGHT, TYPICAL FOR ALL SLEEPING ROOMS.

14 PROVIDE 120V, MOTOR-RATED SWITCH AS DISCONNECTING MEANS FOR EXHAUST FAN. SWITCH TO BE RATED FOR THE HORSEPOWER OF THE MOTOR. FIELD VERIFY LOCATION WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION ROUGH-IN.

LUMINAIRE SCHEDULE

MARK	MANUFACTURER MODEL NUMBER	VOLTAGE/ INPUT WATTS	LAMP TYPE	MOUNTING AND HEIGHT	REMARKS
A	DAY-BRITE 2FGXG48L835-4-RS-UNV-DIM-F1	120V/36W	4800 LUMEN 3500K LED	LAY-IN	2X4 LED TROFFER WITH ROUND SMOOTH CENTER DIFFUSER. MANAGERS OFFICE AND GROUP ROOM
B	DAY-BRITE 2FGXG4SL835-2-RS-UNV-DIM-F1	120V/34W	4800 LUMEN 3500K LED	LAY-IN	2X2 LED TROFFER WITH ROUND SMOOTH CENTER DIFFUSER. OFFICE AND CONTROL ROOM
C2	LIGHTOLIER ENGINE - CR2A0935FLUPZU TRIM - CR2AWH	120V/13.6W	900 LUMEN 3500K LED	RECESSED	2" RECESSED DOWN LIGHT, DAY-ROOM
C4	LIGHTOLIER FRAME - ARA ENGINE/TRIM - P4RDL15935WWHZ10U	120V/12.2W	1500 LUMEN 3500K LED	RECESSED	4" RECESSED DOWN LIGHT, DAY-ROOM, TOILET, LAUNDRY
C4W	LIGHTOLIER FRAME - ARA ENGINE/TRIM - P4RSL15935WWHZ10U	120V/12.2W	1500 LUMEN 3500K LED	RECESSED	4" RECESSED DOWN LIGHT WET LOCATION LISTED, SHOWER
E	ASTRO LEDA SWING ARM 1457008	120V/4W	4W MAX LED MR11 GU10 35MM	SURFACE	READING LIGHT
F	GAMMALUX GPD3-SLSS8EZT-UNIV-ZTV10-##-REC/AGFR1-ATRSG-WSG	120V/70W	3500K LED	RECESSED	COVE LIGHT IN TOILET AREA AT BACK WALL COVE. LENGTH TO BE DETERMINED.
H	ARLEE LIGHTING TGL/4/D/20W/35/A	120V/20W	3500K LED	SURFACE	4' T-GRID LINEAR FOR STANDARD FLAT CEILING SYSTEM
J	HK LIGHTING ZXL20I-CM-B-GSS-120V-X18-40-60-010-BK	120V/18W	4000K LED	SURFACE CEILING	LED SURFACE CEILING LED AT GAZEBO, WET LOCATION LISTED.
K	TEGAN LIGHTING MKA-P-2-K4QP-SPG-AL-C-IDH-ALS/SSAC-LED-10/277-DHO-AS-J-XL-BCLG-3AC12/SEK-AL-FL-XL-36	120V/70W	3000K LED	PENDANT	ACOUSTIC PENDANT IP20
L	KRLIN LIGHTING LSV-12487-2000L-120-41K-37	120V/26W	4000K LED	SURFACE CEILING	12"X4" SURFACE VANDAL DOWNLIGHT, WET LOCATION LISTED
M	STONCO WP60-SCT-10-BZ	120V/40W	4000K LED	LED WALL PACK	EXISTING MH WALL PACK TO BE REPLACED WITH NEW LED WALL PACK. WET LOCATION LISTED.
P	GARDCO GBS-A02-840-T3M-UNV-BK	120V/17W	4000K LED	SURFACE	EXTERIOR WALL SCONCE, VERIFY MOUNTING HEIGHT WITH ARCHITECT. WET LOCATION LISTED, FULL CUTTOFF
Q	DAY-BRITE CFI SDS42448L8CST-UNV-DIM	120V/31W	4000K LED	SURFACE	4' LED STRIP LIGHT
S1	GARDCO OPF-S-A04-T5W-AR1-208-BK	208V/136.2W	4000K LED	POLE LIGHT	27'-6" OVERALL HEIGHT, 2'6" POLE BASE. SQUARE STRAIGHT ALUMINUM POLE
X	ISOLITE UEL-EM-R-1C2M-MTEBR	120V/5W	RED LED	SURFACE	RED LED EXIT SIGN, EDGE LIT, 90 MIN EMERGENCY BATTERY BACKUP.

1. THE LUMINAIRE SCHEDULE INDICATES GENERAL DESCRIPTION OF LUMINAIRE AND MANUFACTURERS CATALOG NUMBERS IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE CORRECT CEILING CONFIGURATION AND PROVIDE THE LUMINARIES WITH ALL NECESSARY TRIMS AND MOUNTING HARDWARE SO THAT BOTH THE CEILING SYSTEM AND THE LUMINARIE CONSTRUCTION MATCHES.
2. IT SHALL BE CONTRACTORS RESPONSIBILITY TO VERIFY EXACT LOCATION OF ALL LUMINAIRES AND TYPE OF CEILINGS WITH ARCHITECTURAL REFLECTED CEILING PLANS AND ELEVATIONS PRIOR TO ANY WORK.
3. A JUNCTION BOX MUST BE PROVIDED WITH ALL EXIT SIGNS CONNECTED TO MORE THAN ONE SET OF CONDUCTORS UNLESS THE EXIT SIGN IS FURNISHED WITH AN APPROVED OUTLET BOX FOR THROUGH WIRING.
4. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO COORDINATE THE FINAL LOCATION OF LUMINAIRES IN MECHANICAL, ELECTRICAL AND OTHER EQUIPMENT ROOMS WHERE CONDUITS, DUCT WORK, PIPING, ETC., ARE PRESENT TO AVOID CONFLICT AND ENABLE PROPER ILLUMINATION DISTRIBUTION.
5. NO SUBSTITUTIONS SHALL BE APPROVED WITHOUT WRITTEN PERMISSION FROM THE ARCHITECT OR ENGINEER. SUBMITTALS SHALL INCLUDE LISTED INPUT WATTS TO BE EQUAL OR LESS THAN INDICATED ON SCHEDULE.
6. FOR DIMMED EMERGENCY FIXTURES PROVIDE UL924 SHUNT RELAY DEVICE WHEN NOT PROVIDED INTEGRALLY WITH FIXTURE.
7. EMERGENCY BATTERY PACKS AND LIGHTING FIXTURE COMBINATIONS (FIXTURE AND BATTERY PACK) SHALL BE RECOGNIZED BY A U.S. NATIONALLY RECOGNIZED LISTING AGENCY PER NEC 110-3(B). (NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) SUCH AS UL, FM, ETL, CSA, ETC.)

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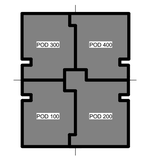
KEYPLAN:



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SEAL:

Date Signed: 09.20.24

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

LIGHTING PLAN - LEVEL 1

Scale: AS NOTED

E2.1

HK Lighting

Project Name

Fixture Type TYPE - J

ZXL20i-CM

LED Ceiling Mount , ZX20 Series

Product Features

- Ceiling mount lighting for architectural down light application.
- ETL outdoor wet location listed. IP65 standard.
- Machined from solid billet 6061-T6 corrosion resistant aluminum.
- Modular components - field changeable LED module & beam spread reflectors.
- Line voltage input with integral LED driver in fixture housing.
- Available in turtle friendly amber model.

Specification

Materials: Machined from billet 6061-T6 corrosion resistant aluminum with 304 stainless steel hardware. Available in 304/316 stainless steel or 360 brass upon request.

Hood and Glare Shield: 2 available hood options to suit any application. 3 optional glare shields (short, long, angled) to complement each hood choice. See page 3 for details.

Voltage: 120, 230 or 277V AC with integral LED driver.

Wattage: 14 or 20W Nichia LED, 16W for Amber LED or 18W Xicato LED.

Light Source: CRI 83. Available in CR95 upon request. The chromaticity range is within a 3 step McAdam Ellipse. Standard CCT options are 2700K, 3000K, 4000K. RGBW.

Lamp Base/Socket: Innovative cone-shaped lamp base and receptacle socket maximize the surface contact area to dissipate heat more effectively. See "Resources" for details.

Dimmability: Phase dimming @120V, 0-10V dimming @120 & 277V.

Finish: Polyester powder coat on all aluminum materials with RoHS compliant procedures. Anodized finish is available. Stainless steel and brass models are provided with brushed surface.

Optical Accessories: Accepts up to 3 accessories (hexcel louver, optical lenses, dichroic color filters, etc.). Secured in place with metal snap ring.

Mounting Method: Utilizes 2x 8-32 UNC machine screws (provided) to attach to a standard octagon recessed back box (provided by others).

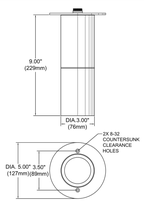
Ordering Guide

EXAMPLE: ZXL20i-CM - B - GSL - 120V - N20 - 27 - 16 - PH - BK - LVR - CM5

SERIES	MATERIAL	HOOD	GLARE SHIELD	VOLTAGE	WATTAGE	CCT	OPTICS	DIMMING	FINISH	OPTICAL ACCESSORY	MOUNTING ACCESSORIES
ZXL20i-CM	BLANK Aluminum (Standard) NBR Natural Brass SS Natural Stainless Steel CU Natural Copper	B B-HOOD C C-HOOD	GSL GSA GSS GSSA CGSL CGSA CGSS CGSA	120V 230V 277V	N14 14W 27 2700K N20 20W 30 3000K A18 18W 40 4000K AMB 16W AMBER	16 16° 25 25° 60 60°	PH Phase dimming on 120V only 0TO 0-10V dimming	BK Black Powder Coat BZ Bronze Powder Coat WT White Powder Coat ABK Anodized Black ACL Anodized Clear CC Custom Powder Coat	LVR Hexcel Louver OSL Overall Spread Lens LSL Linear Spread Lens SDL Subtle Soft Focus DF Dichroic Filter	See page 3 for quick reference or "Accessories" link for detailed specification.

Product Drawings

NOTE: Specification and dimensions subject to change without notice.



HK Lighting 2151 Anchor Ct. Thousand Oaks, CA 91320 TEL 805 480 4881 FAX 805 480 4811 sales@hklighting.com

GARDCO

Wall Mount

GeoForm

GBS LED wall sconce

Project:

Location:

Cat.No.

Type: TYPE - P

Lamps: Qty:

Notes:

Gardco GeoForm block small LED wall sconce features a compact geometric design that will complement a range of architectural styles. GeoForm is available with two light engines: precision plus optics which feature type 2, 3, and 4 distributions, as well as light effects optics which offer wall wash, spot, and pencil beam distributions. GeoForm with light effects may be inverted for a wet location uplight option. A diffuse lens is also available for over doorway applications. Emergency battery backup option provides path-of-egress illumination and multiple control options further enhance energy savings.

Ordering guide

example: GBS-A03-840-T3M-UNV-MG

Luminaire	Configuration (nom. lumens)	Color Temperature	Distribution	Voltage	Dimming Controls[1]	Electrical	Options	Finish
GBS GeoForm Block Small	**Precision Plus optics** A07 1,500 lumens A02[2] 2,500 lumens A03 4,000 lumens A04 5,000 lumens A05 6,000 lumens	830 80CRI 3000K 840 80CRI 4000K 740 70CRI 4000K 750 70CRI 5000K	T2M Type 2 T3M Type 3 T4M Type 4 DFL Diffusing lens	120 120V 208 208V 240 240V 277 277V UNV 120-277V 347 347V 480 480V HVU 347-480V	none Leave blank (0-10V dimming driver standard) DLEA[3] Dimming Leads Externally Accessible (controls by others) FAWS[4] Field Adjustable Wattage Selector	none Leave blank (120V/4A surge protection standard) SP2 Surge Protector 20kV/10kA (option) FS1 Single Fuse (120, 277, or 347VAC) FS2 Double Fuse (208V, 240V, or 480V) PCB[5] Photocontrol Button (120-277V)	none Leave blank Emergency Battery Pack (0-40°C) EM[6] Meets the requirements of the Buy American Act of 1933 (BAA) **Customer specified** OC Specify optional color or RAL; contact factory SC Special Color (must supply color chip, requires factory quote)	**Textured** BK Black WH White BZ Bronze DG Dark Gray MG Medium Gray
	Light Effects optics B07[4] 700 lumens B07[4] 1,100 lumens B07[4] 2,200 lumens	830 80CRI 3000K 840 80CRI 4000K	WAW Wall Wash SPT Spot PEN Pencil Beam					

1. Only available from 120-277V, or in UNV.
2. Only one option can be selected from Dimming Controls column.
3. Not available with Emergency battery pack.
4. Only available from 120-277V, must specify voltage.
5. Failure to properly select the "BAC" suffix could result in you receiving product that is not BAA compliant product with no recourse for an RMA or refund. This BAC designation hereunder does not address (i) the applicability of, or availability of a waiver under, the Trade Agreements Act, or (ii) the "Buy America" domestic content requirements imposed on states, localities, and other non-federal entities as a condition of receiving funds administered by the Department of Transportation or other federal agencies.
6. Consult Signify to confirm whether specific accessories are BAA-compliant.

Luminaire Accessories (order separately)[1]

GF-WS-BK	Wall Mounted Box for surface conduit; painted black
GF-INV	Inversion Mounting kit (required with inverted mounting)

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KEENE

by signify

Wall mount

LytePro

LPW16 medium wall sconce

Keene LytePro LED medium wall sconce LPW16 features outstanding value in a compact, architectural design. This powerful and precise combination offers outstanding energy savings with excellent photometric performance. LPW16 is ideal for entryways and corridors in addition to wall lighting applications requiring strong lateral spacing and forward pattern projection.

Project:

Location:

Cat.No.

Type: TYPE - M

Lamps: Qty:

Notes:

Ordering guide

Example: LPW16-20-NW-G3-3-120-PCB-BZ

Prefix	Wattage	LED Color/Gen	Distribution	Voltage	Options: Photocontrol	Options: Finish
LPW16						
LPW16 LytePro 16 LED medium wall sconce	20 20W 30 30W 50 50W	NW-G3 Neutral White 4000K 70 CRI Generation 3 WW-G3 Warm White 3000K 70 CRI Generation 3	2 Type 2 3 Type 3 4 Type 4	120 120V 208 208V 240 240V 277 277V 347 347V 480 480V UNV 120-277V (50/60Hz) HVU 347-480V (50/60Hz)	--- None PCB Photocontrol Button[1]	**Textured** BK Black WH White BZ Bronze DGY Dark Gray MGY Medium Gray **Customer specified** RAL Specify optional color or RAL (ex. OC-LGP or OC-RAL7024) CC Custom color (Must supply color chip for required factory quote)

Stocked luminaires – Ordering guide

Catalog Number	Description	Master Pack, Qty	UPC Code
LPW16-G3-8-BZ	LPW16, 30W, 650mA, 4000K, Type 3, 120-277V, Bronze textured paint	6	622252813872
LPW16-G3-8-DGY	LPW16, 30W, 650mA, 4000K, Type 3, 120-277V, Dark gray textured paint	6	622252813865

Stocked accessories – Ordering guide (Must be ordered separately)

Catalog Number	Description	Master Pack, Qty	UPC Code
LPWCVRPLT-BZ[1]	LPW Universal wall cover mounting plate, Bronze textured paint	(none)	190096144860

[1] Must specify voltage. Not available in 347V or 480V.
[2] Other colors available upon request as made-to-order

GARDCO

Site and Area

OptiForm

OPF-S Small

Project:

Location:

Cat.No.

Type: TYPE - R

Lamps: Qty:

Notes:

Gardco OptiForm site and area luminaires are available in three sizes: small, medium and large. Featuring the latest in LED technology, OptiForm achieves up to 192 lumens per watt. Eleven optical distributions are available, suitable for a range of outdoor lighting applications. OptForm features a unique mounting system with a two-piece housing for hassle-free installation. Mounting options include a standard arm, mast arm, and wall mount bracket. Service Tag is a standard feature with every OptiForm luminaire, providing maintenance or upgrade assistance throughout the life of the product.

Ordering guide

example: OPF-S-A01-840-T4M-AR1-120-BLS0-L3-BZ

Luminaire	Configuration (nom. lumens)	Color Temperature	Distribution	Mounting	Voltage
OPF-S					
OPF-S OptiForm Small Area	**Site and Area** A01 7,000 lumens A02 9,000 lumens A03 11,000 lumens A04 15,000 lumens A05 17,000 lumens A06 19,000 lumens A07 20,000 lumens	**Precision Plus[1]** (T2M, T3M, T4M, T5M only) P01 2,500 lumens P02 4,000 lumens P03 6,500 lumens P04 9,000 lumens P05 11,500 lumens P06 14,000 lumens P07 16,500 lumens P08 19,000 lumens P09 22,000 lumens	827 80CRI 2700K 830 80CRI 3000K 840 80CRI 4000K 727 70CRI 2700K 730 70CRI 3000K 740 70CRI 4000K 750 70CRI 5000K	AFR Autofront row T2M Type 2 medium T3M Type 3 medium T4M Type 4 medium T4W Type 4 wide T5N Type 5 narrow T5M Type 5 medium T5W Type 5 wide	LCL LEED corner optic left LCR LEED corner optic right BLC Back light control 2RL Type 2 rotated left 90° 2RR Type 2 rotated right 270° 3RL Type 3 rotated left 90° 3RR Type 3 rotated right 270° 4RL Type 4 rotated left 90° 4RR Type 4 rotated right 270°	**ARM[2]** Arm mount (standard) **MAS[2]** Mast arm **WAL** Wall mount **MOS[2]** Mounting ordered separately	120 120V 208 208V 240 240V 277 277V 347 347V 480 480V UNV 120-277V **HVU[3]** 347-480V

Dimming Controls	Sensing	Options (electrical, mechanical, etc)	Emergency	Finish
The following options include 0-10V Driver none 0-10V dimming driver DLEA[4] Dimming leads externally accessible (controls by others) FAWS[4,5] Field adjustable wattage selector BLS0[7,16] Bi-level with motion sensor	L2 PIR sensor, #2 lens (Required if BLS0 is selected)	None Surge protector 10kV/10kA standard SP2 Surge protector 20kV/10kA (option) FS1[7] Single fuse (120, 277, or 347VAC) FS2[7] Double fuse (208, 240, or 480V) PCB[7,16] Photocontrol button connected to 0-10V driver TBS NEMA Twist-lock 5-pin receptacle connected to 0-10V driver TR7[7] 7-pin twist lock receptacle connected to D4i compliant driver TLP[7,16] 7-pin twist lock receptacle connected to D4i compliant driver w/ 3-pin photocell EHS Housing machined to accept external house side shield for field install. Must be combined with OPF-S-EHS-1 accessory BAC[7,8] Meets the requirements of the Buy American Act of 1933 (BAA)	**EM[7,9,10]** Emergency Battery Pack (0-40 °C) Available with precision plus optics P01-P03 only	**Standard textured finish** BK Black WH White BZ Bronze DG Dark Gray MG Medium Gray **Customer specified** OC Special optional color or RAL; consult factory SC Special color (must supply color chip, requires factory quote)
The following options include SR/DALI Driver WAP[4,6,11] Wireless Interact (includes SR-dri-ver and SR receptacle) SRDR[4,6,11] SR driver connected to Zhega socket (D4i) **DynaDimmer: Automatic Profile Dimming** CS50[7,11] Security 50% dimming, 7 hours CM50[7,11] Median 50% dimming, 8 hours CS30[7,11] Security 30% dimming, 7 hours CM30[7,11] Median 30% dimming, 8 hours	**WAP sensor options** LB Low (7–15' mounting height) sensor, black color housing w/ wireless Interact, integral LW Low (7–15' mounting height) sensor, white color housing HB High (15'–40' mounting height) sensor, black color housing HW High (15'–40' mounting height) sensor, white color housing	**(Blank):** None -E2: Remote inverter for 100% rated lumens, 90+ minutes, N/A for Option -E1 -EM: Internal emergency battery pack. Delivers 500 lumens; CEC Compliant; 90+ minutes. -EMR: Remote emergency battery pack. Delivers 1000 lumens; CEC Compliant; 90+ minutes; N/A with pendant mount	**(Blank):** Standard white enamel with prismatic acrylic lens **Housing Finishes** -35: Silver enamel finish -37: Dark bronze enamel finish -38: Black enamel finish -94: Custom color/finish; specify; consult factory **Trim Features** -46: Gasket between lens and trim **Lens Options** -23: Frosted microprismatic lens instead -46: Gasket between trim and lens -CF: Custom color filter (Rosco); specify -WA: White acrylic lens instead	**(Blank):** Standard surface mount -90: 2" collar for mounting beneath surface outlet box; ½" T.S. KO's covered ceilings only -97: Custom length pendant; for -PM -98: Swiled canopy for sloped ceilings fo 40°; with -PM -PM: Pendant stem; 8" stem or see -97	**(Blank):** None -99: Special modification; consult factory -FS: Single in-line fuse. Not for use with Option -E1 -NAT: Modified for natatorium use

1. Extended leadtime applies. Consult factory for details.
2. Mounts to a square pole with knockout for 4–5" OD round pole.
3. Mounts to a horizontal 2-3/8" OD x 6" Long tenon.
4. Must be ordered with mounting accessory. Photocell option (TR7) must be selected with mounting accessory. See Page 2 for options.
5. Not available with other dimming control options (mutually exclusive).
6. Not available with motion sensor (physical restriction).
7. Must be specified with a motion sensor lens (L2).
8. Not available with PCB, TRS.
9. Must be specified with a motion sensor LW, LB.
10. Not available with TR7, TLP.
11. Must specify input voltage.
12. Not available in HVU [347–480V].
13. UNV [120–277V] only available for lumen packages P03–P09. HVU [347–480V] only available for lumen packages P06–P09 & A04–A07.
14. Not available for lumen packages P04–P09.
15. Not available with Dynadimmer, SRDR, FAWS, FS1, FS2, DLEA, BLS0 (physical restriction).
16. Precision Plus Optics (P01–P09) available only with T2M, T3M, T4M, and T5M distributions. Consult factory for other distributions.
17. OPF-RMB accessory recommended for retrofit applications.
18. Failure to properly select the "BAC" suffix could result in you receiving product that is not BAA compliant product with no recourse for an RMA or refund. This BAC designation hereunder does not address (i) the applicability of, or availability of a waiver under, the Trade Agreements Act, or (ii) the "Buy America" domestic content requirements imposed on states, localities, and other non-federal entities as a condition of receiving funds administered by the Department of Transportation or other federal agencies.

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KIRLIN

ARCHITECTURAL LIGHTING

CATALOG # TYPE TYPE - L

JOB NAME WATTAGE VOLTAGE

Latitudes Series LED Lighting

LSV-12487

Surface Vandal 12" Downlight

Up to 90,000 Hour Rated Life • Wet Listed

LM-80 and LM-79 Certified

Specifications

Delivered System Performance
- Nominal Lumens: **Must Specify**
  - **-2000L**
  - **-3500L**
  - **-5000L**
- Select trim & beam distribution: WFL
- Select color (CCT): see chart; 80+ CRI standard; Option -HC for 90+ (15% lumen loss)
- 90,000 Hour Rated Life (L70)

Thermal Management System
- All aluminum heat sink and components for cool operation, long life, low maintenance

LED Driver - INTERNAL
- Indoor/Outdoor: -30°C to 60°C (-22°F to 140°F)
- 0-10V CCR 10% dimming standard
- 120-277V / 50-60 Hz standard; load insensitive

Trim Assembly
- Vandal resistant seamless white self-flanged aluminum, one piece self-flanged trim
- Flush center pin tamperproof hex screws and captive nuts secure trim to housing
- High-strength prismatic acrylic above ¼" clear flat polycarbonate
- Tamperproof tool included

Aluminum Housing
- Seamless white acrylic enameled finish
- Rustproof: Exceeds 1000 hour ASTM 5% salt spray test
- Water-tight construction with weatherproof closed cell top gasket for wet location use
- No visible cylinder hardware
- Cool operation: Extends life of all components
- Fully sustainable: Entire luminaire is modular, easily visible, and serviced through aperture
- Lightweight: minimizes ceiling load
- See Options for additional finishes and mounts

Installation
- Direct mount to any J-box pattern
- Indoor or outdoor
- Option -PM for pendant mount

UL, C-UL (Canada) Listings
- Wet listed in surface or pendant mount

IEC & FCC Compliance
- Meets IEC/EN 61000-3-2 electromagnetic compatibility standard for medical electrical equipment
- FCC Part 15 certified for EMI/RFI emissions

FIVE YEAR Limited Warranty
- Complete standard fixture

Made in the USA *BAA Compliant* · Vandal Resistant · Natatorium *See Option -NAT* · FCC Part 15 Certified · UL Listed Wet, Damp, Dry

Options and Ordering Configuration

(Example: LSV-12487-2000L-120-50K-94-NAT)

Must Specify				Optional				
Model	**Lumens**	**Volts**	**CCT & CRI**	**Driver Options**	**Emergency Options**	**Housing/Trim/Lens**	**Mounting Options**	**Other Options**
LSV-12487								
	-2000L -3500L -5000L	-120 -277 -UNV[1] Other Voltage	**(Blank):** 3500K, 80+ CRI **80+ CRI*** -27K: 2700°K -30K: 3000°K -35K: 3500°K -41K: 4100°K -50K: 5000°K ***Note:** Lumen Factor = 0.93 for -27K **90+ CRI**** -27K-HC: 2700°K -30K-HC: 3000°K -35K-HC: 3500°K -41K-HC: 4100°K -50K-HC: 5000°K ****Note:** Lumen Factor = 0.79 for -27K-HC, All Others = 0.85; Consult Factory [1] Consult factory	**(Blank):** Standard 0-10V CCR 10% dim -D1[1]: 0-10V 1.0% dim -D2[1]: 0-10V 0.1% dim -D3[1]: DALI 1.0% dim -D4[1]: DALI 100-0.1% dim -DAO: 40°C driver with 0-10V 10% dimming instead [1]Consult factory for use with -2000L series	**(Blank):** None -E2: Remote inverter for 100% rated lumens, 90+ minutes, N/A for Option -E1 -EM: Internal emergency battery pack. Delivers 500 lumens; CEC Compliant; 90+ minutes. -EMR: Remote emergency battery pack. Delivers 1000 lumens; CEC Compliant; 90+ minutes; N/A with pendant mount	**(Blank):** Standard white enamel with prismatic acrylic lens **Housing Finishes** -35: Silver enamel finish -37: Dark bronze enamel finish -38: Black enamel finish -94: Custom color/finish; specify; consult factory **Trim Features** -46: Gasket between lens and trim **Lens Options** -23: Frosted microprismatic lens instead -46: Gasket between trim and lens -CF: Custom color filter (Rosco); specify -WA: White acrylic lens instead	**(Blank):** Standard surface mount -90: 2" collar for mounting beneath surface outlet box; ½" T.S. KO's covered ceilings only -97: Custom length pendant; for -PM -98: Swiled canopy for sloped ceilings fo 40°; with -PM -PM: Pendant stem; 8" stem or see -97	**(Blank):** None -99: Special modification; consult factory -FS: Single in-line fuse. Not for use with Option -E1 -NAT: Modified for natatorium use

LATITUDES SERIES LSV-12487

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JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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Civil Contact

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MEP Contact

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PRICE CONSULTING, INC
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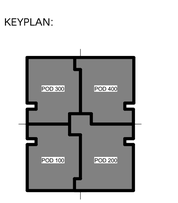
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

KEYPLAN:



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SEAL:

Date Signed: 09.20.24

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

LIGHT FIXTURES CUT SHEETS

Scale: AS NOTED

E2.2

M - GAS FURNACE/ELECT. COOLING SPLIT SYSTEM (INDOOR)

			BASIS OF DESIGN														COOLING CAPACITIES (GROSS)						HEATING CAPACITIES (GROSS)			
			FAN COIL		FURNACE						MOTOR DATA						ENT AIR	AMBIENT		MBH			ENT AIR	AMBIENT	TOTAL	
TAG	MARK	NOMINAL TONS	MANUFACTURER	MODEL	MANUFACTURER	MODEL	TOTAL CFM	OSA CFM	ESP/ IWG	GAS INPUT (MBH)	GAS EFF. (%)	HP	VOLTAGE	PHASE	MAX. FLA	MOCP	OPERATING WEIGHT	SEER/EER	DB	WB	DB	WB	TOTAL	SENSIBLE	DB	DB	MBH	REMARKS
FC	1	2	CARRIER	CAPM	CARRIER	59SC	650	SEE CALCS	0.8	60	96	1	208 V	3	10.1	15 A	200 lb	15.2 SEER	78	64	95	78	17.7	14.6	-	31.4	58	SEE NOTES BELOW
FC	2	10	CARRIER	39LA10	REZNOR (DUCT HEATER)	SC125	4310	SEE CALCS	2.36	125	80	5.0	208 V	3	14.3	30 A	998 lb	11.2 EER	77.2	64	95	78	111	96	-	31.4	100	SEE NOTES BELOW
FC	3	10	CARRIER	39LA10	REZNOR (DUCT HEATER)	SC125	4310	SEE CALCS	2.36	125	80	5.0	208 V	3	14.3	30 A	998 lb	11.2 EER	77.2	64	95	78	111	96	-	31.4	100	SEE NOTES BELOW

NOTE:
1. MANUFACTURER SHALL SIZE REFRIGERANT LINES AND SHALL PROVIDE NECESSARY REFRIGERANT SPECIALTIES FOR LONG LINE APPLICATIONS, IF APPLICABLE.
2. MANUFACTURER TO GUARANTEE AND ASSURE PROPER OPERATION OF REFRIGERANT SYSTEM.
3. PROVIDE WITH 7 DAY PROGRAMMABLE T-STAT IN LOCKABLE COVER, AUTO-CHANGE OVER.
4. PROVIDE AN APPROVED SECONDARY DRAIN SYSTEM WHERE DAMAGE TO BUILDING COMPONENTS WILL OCCUR AS A RESULT OF OVERFLOW OR STOPPAGE OF THE PRIMARY CONDENSATE DRAIN.

SPLIT SYSTEM OUTDOOR CONDENSING UNIT SCHEDULE

			BASIS OF DESIGN		ELECTRICAL DATA					AMBIENT DATA			SEER/	HSPF/	OPERATING	
TAG	MARK	NOMINAL TONS	MANUFACTURER	MODEL	VOLTAGE	PHASE	MCA	MOCP	SCCR	AMB DB	AMB WB	WIN DB	EER	COP	WEIGHT	REMARKS
CU	1	1.5	CARRIER	24SCA	208 V	1	11.4 A	20 A	5KA				12.2 EER2		113 lb	SEE NOTES BELOW
CU	2	10	CARRIER	38AUZ	208 V	3	45.0 A	60 A	5KA				11.2 EER		490 lb	SEE NOTES BELOW
CU	3	10	CARRIER	38AUZ	208 V	3	45.0 A	60 A	5KA				11.2 EER		490 lb	SEE NOTES BELOW

M - EXHAUST FAN SCHEDULE

						MOTOR DATA		MOTOR DATA		BASIS OF DESIGN		
TAG	MARK	SYSTEM	TYPE	CFM	FAN RPM	BHP	VOLTAGE	PHASE	OPERATING WEIGHT	MANUFACTURER	MODEL	REMARKS
EF	1	EXHAUST	IN-LINE	100	980	0.03	115 V	1	24 lb	GREENHECK	CSP-A125-QD	SEE NOTES BELOW
EF	2	EXHAUST	IN-LINE	100	980	0.03	115 V	1	24 lb	GREENHECK	CSP-A125-QD	SEE NOTES BELOW
EF	3	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	SEE NOTES BELOW
EF	4	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	SEE NOTES BELOW
EF	5	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	SEE NOTES BELOW
EF	6	EXHAUST	ROOFTOP	400	1474	0.07	208 V	1	28 lb	GREENHECK	G-090-VG	SEE NOTES BELOW

NOTE:
1. FAN TO BE CONTROLLED BY TIME CLOCK

WATTSTOPPER®

PASSIVE INFRARED LINE VOLTAGE CEILING SENSOR

CI-355

DESCRIPTION

Wattstopper's CI-355 passive infrared (PIR) occupancy sensor automatically turns lighting on and off based on occupancy. The sensor mounts on the ceiling with a flat, low-profile appearance and provides 360 degrees of coverage.

OPERATION

The CI-355 is line voltage and operates on a single phase at 120, 230, 277 or 347 VAC. The sensor uses passive infrared technology (PIR) to sense occupancy and automatically turn lighting on. PIR works by sensing the difference between infrared energy from a human body in motion and the background space. When no occupancy is detected for the length of the time delay, lighting automatically turns off.

TIME DELAY OPTIONS

The CI-355 is factory set for a 20 minute time delay, ideal for both energy savings and user satisfaction in most applications. Installers can quickly select other fixed time delays (5, 10, 15 or 30 minutes) via DIP switches. Fixed time delays eliminate the occupant dissatisfaction associated with an automatically adjusted time delay option, and reduce callbacks. Walk-through mode may be enabled for added energy savings in spaces with frequent transient traffic.

APPLICATIONS

The CI-355 works well in open office spaces, computer rooms, conference rooms, classrooms, and warehouses. It is a good choice for areas with high ceilings or with two-level lighting. The convenient mounting system keeps installation costs down. It also eliminates the need for a power pack by using line voltage wiring.

FEATURES

- Advanced control logic based on RISC micro-controller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - Walk-through mode turns lights off 3 minutes after the area is initially occupied – ideal for brief visits such as mail delivery
  - Built-in light level sensor featuring simple, one-step set-up
- Zero-crossing for long relay life
- LED indicates occupancy detection
- DIP switch simplifies sensor adjustments
- Clip mounting system makes ceiling tile installation simple
- Uses existing line voltage wiring and doesn't require a power pack
- Sensor coverage tested to NEMA Guide Publication WD 7-2000

PROJECT		LOCATION/ TYPE	

WATTSTOPPER®

DUAL TECHNOLOGY WALL SWITCH OCCUPANCY SENSORS

LMDW-100

DESCRIPTION

LMDW-100 Series Digital Dual Technology Wall Switch Occupancy Sensors use PIR and ultrasonic technology to detect occupancy for energy-efficient control of lighting and plug loads. They also include one or two switch buttons for manual control of selected loads, and are part of a Wattstopper Digital Lighting Management (DLM) system.

OPERATION

LMDW-100 Series sensors operate on Class 2 power supplied to a DLM local network by one or more DLM room controllers. They work with the room controller(s) to control loads based on occupancy. Default operation is automatically established by Plug n' Go, which recognizes the device as both an occupancy sensor and a switch. The sensor and switch button functionality and load assignments will be the same as stand-alone sensors and switches. A system with one load defaults to manual-on, while a system with two or more loads defaults to auto-on for load 1 and manual on for other loads. Initially, all occupancy sensors control all loads, and all switches provide multi-way control of all loads. Two-button units can be programmed so that one button raises the level of a dimmed load, and the other button lowers the level.

DIGITAL SETTINGS AND IR COMMUNICATIONS

LMDW-100 Series sensors may be reconfigured at the device with easy-to-use pushbuttons, or via the LMCT-100-2 wireless configuration tool that communicates with the sensor using a bi-directional infrared (IR) signal. Each sensor is equipped with a unique, easy-to-access, scrolling LCD screen that displays sensor parameters and simplifies changing those parameters. Time delay and sensitivity can be precisely adjusted and walk through mode can be activated. The LCD display also facilitates system personalization, scrolling load information when in Push n' Learn mode. Both load assignments and load parameters may be changed using Push n' Learn. Additionally, each sensor includes an IR transceiver that allows wireless system operation in addition to configuration.

APPLICATIONS

Wattstopper's dual technology has the flexibility to work in a variety of applications where one technology alone may not be sufficient. Common LMDW-100 Series sensor applications include small private offices, executive offices, small and medium conference rooms and lunch/break rooms.

FEATURES

- Plug n' Go™ automatic configuration for quick installation and maximum energy savings
- Push n' Learn™ functionality for customization without the need for tools or a PC
- Infrared (IR) transceiver for wireless configuration and control
- Sleek single gang devices fit decorator wall plates; 1- and 2-button models; six color options
- Each switch button can control individual or multiple loads, or one scene; LED indicates status
- Sensors may be used for multi-way control
- Each switch button can be used to raise or lower load levels
- Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
- Sensor coverage tested to NEMA Guide Publication WD 7-2000
- This product meets the materials restrictions of RoHS
- BAA/TAA-compliant models available

PROJECT		LOCATION/ TYPE	

WATTSTOPPER®

ON/OFF/0-10 VOLT DIMMING ROOM CONTROLLERS

LMRC-210 SERIES

DESCRIPTION

LMRC-210 Series Digital Room Controllers include one, two or three relay(s) to switch a total of 15 or 20 amps, a high-efficiency switching power supply and one 0-10 volt output per relay for control of dimmable loads including electronic ballasts (Advance Mark 7, or equivalent). They are the foundation of a Wattstopper Digital Lighting Management (DLM) system, and allow integration of occupancy sensors, daylighting controls and switches for energy-efficient lighting control.

OPERATION

LMRC-210 Series Room Controllers operate on one 120, 230, 240, or 277 volt, 20 amp, or 347 volt, 15 amp, feed and provide Class 2 power to sensors and switches via the DLM local network. Once powered up, Plug n' Go automatically configures system components for the most energy-efficient operation. The room controllers then dim or switch lighting or motor loads in response to input from the communicating devices. When a dimming input is received, the relay switches on when the dimmed level rises above zero, and off when it reaches zero, to coordinate control of power and the 0-10 volt signal to the load. They also monitor the current draw of the total connected load. Each room controller stores up to 16 scene preset levels for each dimmed output. Additionally, the LMCT-100-2 wireless configuration tool can be used for load configuration.

Room controllers built starting Q3 of 2012 include circuitry to open their 0-10V signal on loss of LMRC's power, so any separately powered ballast or driver connected to those 0-10V wires will go to full brightness.

PLUG N' GO AUTOMATIC CONFIGURATION

DLM room controllers manage Plug n' Go automatic system configuration, which establishes functionality based on the installed components. When room controllers are connected only to occupancy sensors, the system defaults to automatic on/off operation. If a wall switch is added to a system with one load, the load defaults to manual-on/automatic-off operation. If there is a wall switch and multiple loads, load one turns on automatically, while additional loads default to manual-on control; all loads turn off automatically. At system startup, default dimming parameters are established including: levels for scene presets 1-4; fade times; and fade and ramp rates. Dimming and system parameters may be customized using Push n' Learn.

APPLICATIONS

LMRC-210 Series Room Controllers are ideal for single or multiple zone on/off or dimming lighting control applications. They are appropriate for applications in private offices, open offices, conference rooms and classrooms in any commercial building. LMRC-210 Series Room Controllers also help facility managers who want to track building power usage by monitoring current for lighting or other loads. A network bridge (LMBC-300) is required to expose DLM local network power data readings to a Segment Manager or BAS.

PROJECT		LOCATION/ TYPE	

WATTSTOPPER®

PLUG LOAD CONTROLLER

LMPL-101

DESCRIPTION

LMPL-101 Plug Load Controllers include a 20 amp relay for on/off control of connected outlets, and a high-efficiency switching power supply. They are part of a Wattstopper Digital Lighting Management (DLM) system, and enable energy-efficient control of plug loads.

OPERATION

LMPL-101 Plug Load Controllers operate on 120 volts and provide Class 2 power to sensors and switches via the DLM local network. Once powered up, Plug n' Go automatically configures system components for the most energy-efficient operation. The plug load controllers then switch controlled outlets on and off in response to input from any communicating occupancy sensors. The DLM system may be reconfigured using Push n' Learn without the need for tools or a PC. Additionally, the LMCT-100-2 wireless configuration tool can be used for load configuration.

PLUG N' GO & PUSH N' LEARN CONFIGURATION

Plug n' Go automatic configuration establishes system functionality based on the installed components. Plug Load Controllers are initially controlled by all of the occupancy sensors on the DLM local network, and default to automatic on/off operation whether or not there is a switch on the local network. DLM system operation may be reconfigured using Push n' Learn. As an example, a selected switch button may be bound to a plug load controller for manual-off control of outlets. Similarly, the plug load controller could be bound only to selected occupancy sensors.

APPLICATIONS

LMPL-101 Plug Load Controllers ensure that energy is not wasted when portable loads such as task lighting and computer monitors are plugged into building outlets. Plug Load Controllers should be installed to switch outlets for lighting and non-essential equipment in private offices, open offices, lunch rooms and break rooms and other areas in commercial buildings. They are appropriate for LEED projects and help building owners realize a higher return on investment on energy code-required occupancy sensors.

FEATURES

- Plug n' Go™ automatic configuration for quick installation and maximum energy savings
- Push n' Learn™ functionality for personalization without the need for tools or a PC
- Digital Lighting Management components plug together on a free-topology Cat 5e DLM local network
- Load On/Off button
- LED indicates status of connected load
- 3 RJ45 ports with integral strain relief and hinged dust cover
- Zero-crossing circuitry for reliability and increased product life
- Attach to standard electrical box through ½" knockout; UL2043 plenum rated
- Ships with "Sensor Controlled" labels for connected outlets
- The product meets the materials restrictions of RoHS
- Qualifies for ARRA-funded public works projects

PROJECT		LOCATION/ TYPE	

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

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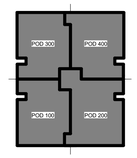
KEYPLAN:



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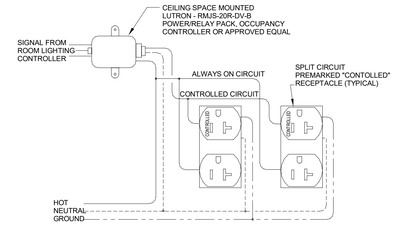
ISSUE:

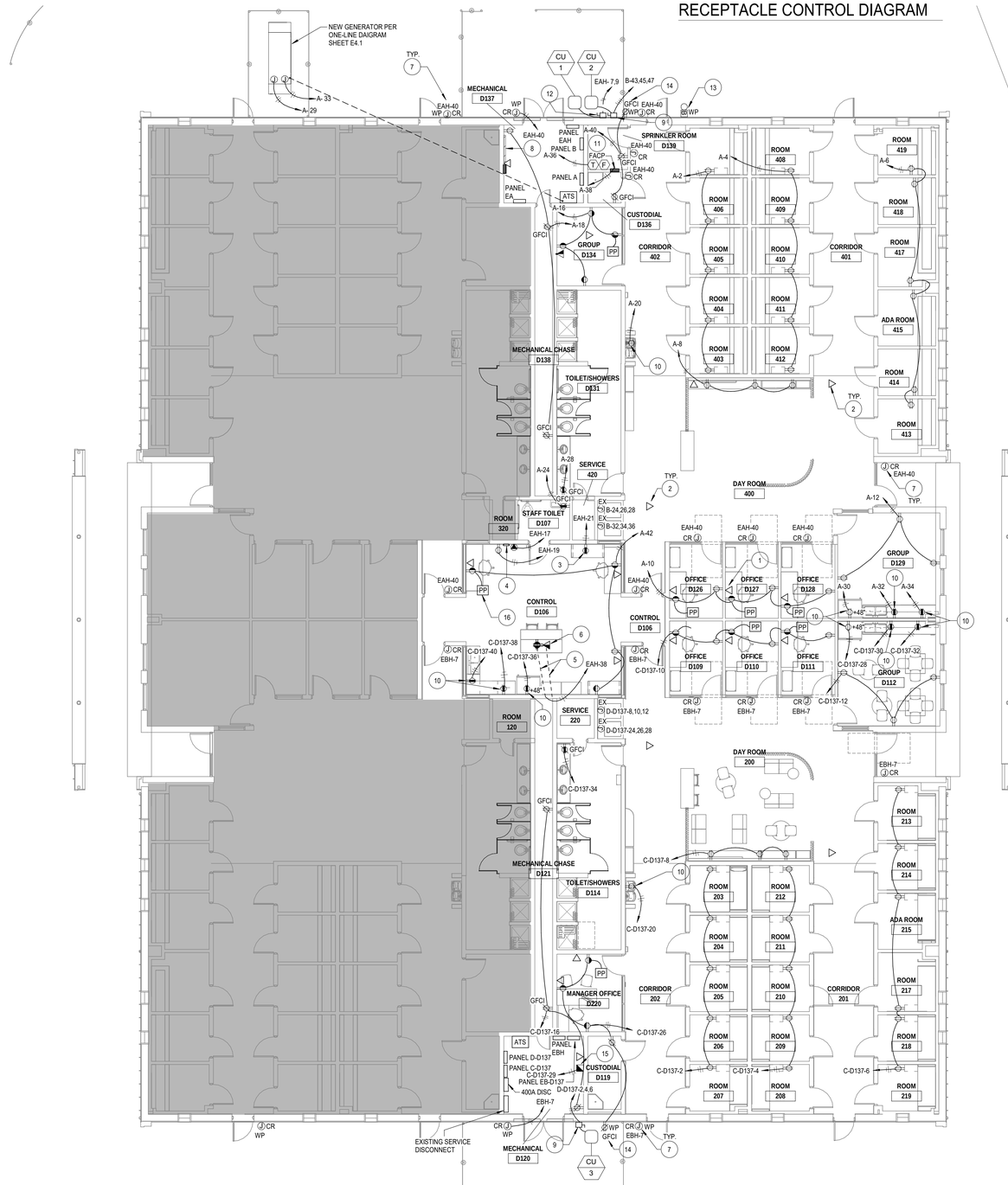
LIGHTING CONTROLS DIAGRAMS/ SCHEDULES

Scale: AS NOTED

E2.3



RECEPTACLE CONTROL DIAGRAM



2 POWER PLAN - LEVEL 1
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A COORDINATION OF OVERCURRENT PROTECTIVE DEVICES SHALL BE BY ELECTRICAL CONTRACTOR AT THEIR OWN EXPENSE, INCLUDING SETTINGS OF CIRCUIT BREAKERS, FUSES AND GROUND FAULT DEVICES. CONTRACTOR SHALL PROVIDE COORDINATION STUDY AND SET ALL CIRCUIT PROTECTIVE DEVICE SETTINGS AS RECOMMENDED AT THE COMPLETION OF THE PROJECT.

B ROUTE ALL FEEDERS AND BRANCH CIRCUITS FOR ROOF TOP EQUIPMENT BELOW ROOF DECK. IF INSTALLED UNDER METAL-CORRUGATED SHEET ROOF DECK, PROVIDE A MINIMUM OF 1.5" MEASURED FROM THE LOWEST SURFACE OF THE ROOF DECKING TO THE TOP OF THE CABLE, RACEWAY OR BOX, PER NEC 300.4(E)

C IF GFCI RECEPTACLE IS NOT READILY ACCESSIBLE PER NEC 210.8, CONTRACTOR SHALL INSTALL GFCI BREAKER IN LIEU OF GFCI RECEPTACLE.

D DOORS INTO ELECTRIC PANEL ROOMS, ETC. SHALL BE MARKED WITH A SIGN STATING "ELECTRICAL ROOM" PER 2012 IFC 605.3.1. COORDINATE SIGN LOCATIONS WITH GENERAL CONTRACTOR PRIOR TO ORDERING. TYPICAL ALL BUILDINGS.

E ALL MATERIALS INSTALLED IN PLENUM SHALL BE APPROVED FOR THAT LOCATION AND PLENUM RATED. TYPICAL PER 2012 IMC 602 & 2011 NEC 300-22B.

F ROUTE ALL FEEDER AND BRANCH CIRCUITS FOR ROOF TOP EQUIPMENT TO UNDERSIDE OF ROOF DECK.

G COORDINATE WITH MECHANICAL DRAWINGS FOR EXACT LOCATION AND REQUIREMENTS OF MECHANICAL UNITS EQUIPMENT.

H ELECTRICAL CONTRACTOR SHALL FIELD VERIFY WITH OWNER ALL SWITCH AND OUTLET LOCATIONS PRIOR TO ROUGH-IN.

I ELECTRICAL BOXES IN FIRE RATED WALLS SHALL BE LISTED AND TESTED FOR USE IN FIRE RATED ASSEMBLIES IN ACCORDANCE WITH THEIR LISTING AND INSTRUCTIONS, AND SHALL COMPLY WITH THE REQUIREMENTS OF IBC 706.8.

KEYED NOTES

1 PROVIDE 120 mm SQ. X 54 mm DEEP (4-11/16" SQ. X 2-1/8" DEEP) J-BOX WITH SINGLE-GANG MUD RING AND 21 mm (3/4") CONDUIT WITH PULLWIRE STUBBED 76 mm (3") INTO ACCESSIBLE CEILING FOR VOICE/DATA.

2 LOCATE JUNCTION BOX ABOVE CEILING FOR ACCESS POINT, COORDIANTE REQUIREMENTS WITH INSTALLING CONTRACTOR PRIOR TO ROUGH-IN.

3 COORDIANTE ELEVATION OF SECURITY PANEL ON WALL PRIOR TO ROUGH-IN.

4 PROVIDE COPPER GROUND BAR FOR SERVER RACK WITH #4 STRANDED CU CABLE TO THE EXISTING SERVICE GROUND BUS. VERIFY LOCATION WITH RACK INSTALLER PRIOR TO ROUGH-IN.

5 SAWCUT AND TRENCH FLOOR FOR NEW CONDUITS TO CONDTROL DESKS. ROUTE CONDUIT IN WALL UP TO ACCESSIBLE CEILING SPACE. INSTALL (2) 1" CONDUITS FOR POWER AND (2) 2" CONDUITS FOR DATA. BACKFILL AND PATCH FLOOR TO MATCH EXISTING.

6 PROVIDE FLUSH ROUND MULTI-SERVICE, FLOOR MOUNTED DUPLEX RECEPTACLE & DATA/PHONE JACKS. PROVIDE WITH BRASS RING AND CAP. HUBBELL SYSTEM ONE OR ENGINEER APPROVED EQUAL. WITH ALL APPURTENANCES AS REQUIRED. VERIFY COLOR PRIOR TO ORDERING.

7 PROVIDE CARD READER J-BOX. VERIFY MOUNTING HEIGHT AND LOCATION PRIOR TO ROUGH-IN. PROVIDE 1/2" CONDUIT FROM JUNCTION BOX INTO CEILING SPACE FOR CONTROL. PROVIDE ALL CONDUIT AND CABLING FROM JUNCTION BOX TO DOOR RELEASE MECHANISM TO MAKE DOOR FULLY FUNCTIONAL.

8 TELEPHONE MOUNTING BOARD (TMB). PROVIDE 4'X8'X3/4" TYPE "X" PLYWOOD PAINTED TO MATCH WALLS. PROVIDE #4 A.W.G. CU. GROUND PER NEC 800.100(B).

9 ELECTRICAL CONTRACTOR SHALL PROVIDE N3R, HD, 60A/3P DISC. SWITCH. INSTALL RK5 FUSES PER MANUFACTURER RECOMMENDATION. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING.

10 PROVIDE GFCI BREAKER AT PANEL. RECEPTACLE IS INACCESSIBLE.

11 NEW FIRE ALARM CONTROL PANEL. PROVIDE 120V CIRCUIT TO PANEL AND 3/4" CONDUIT FROM PANEL TO TELEPHONE BOARD. COORDINATE EXACT LOCATION WITH FIRE ALARM CONTRACTOR PRIOR TO ROUGH-IN.

12 ELECTRICAL CONTRACTOR SHALL PROVIDE HD, NEMA-1, 30A/2P DISC. SWITCH. INSTALL RK5 FUSES PER MANUFACTURER RECOMMENDATION. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING.

13 PROVIDE WEATHERPROOF BELL. COORDINATE LOCATION WITH FIRE ALARM CONTRACTOR PRIOR TO INSTALLATION.

14 ELECTRICAL CONTRACTOR SHALL PROVIDE IN-USE WEATHERPROOF RECEPTACLE PER NEC 406.9(B) WITH GFCI RECEPTACLE LOCATED WITHIN 25' OF EQUIPMENT PER NEC ARTICLE 210.63.

15 TIME CLOCK N3R. HOLIDAY AND WEEKLY SCHEDULE AND 2 HOUR SET BACK. PROVIDE BATTERY FOR UP TO 4 HOUR POWER LOSS. PROVIDE 2, 20 A. SWITCHES WITH INDEPENDENT PROGRAMMING.

16 PROVIDE POWER PACK/RELAY PER MANUFACTURE REQUIREMENTS. PROVIDE ALL NECESSARY COMPONENTS FOR A FULLY FUNCTION SYSTEM. REFER TO CONTROLS DRAWING E2.3 FOR POWER PACK/RELAY SELECTION. LOCATION SHOWN FOR INFORMATION ONLY, POWER PACK MUST BE LOCATED IN AN ACCESSIBLE LOCATION. POWER PACK SHALL BE CONTROLLED BY A CEILING MOUNT OCCUPANCY SENSOR. PROVIDE CEILING MOUNTED SENSOR AS REQUIRED TO MAKE SYSTEM FULLY OPERATIONS.

FIRE ALARM NOTES:

FIRE ALARM WILL BE SUBMITTED AS A DEFFERED SUBMITTAL. ALL DEFFERED SUBMITTALS SHALL HAVE PRIOR APPROVAL OF BUILDING OFFICIAL. ANY DEVICES SHOWN ON ELECTRICAL PLANS ARE FOR BID PURPOSES ONLY AND NOT FOR CONSTRUCTION. FIRE ALARM CONTRACTOR IS TO PROVIDE COMPLETE SET OF DRAWINGS AND SUBMIT TO CITY FOR REVIEW AND APPROVAL AS REQUIRED BY AHJ, PRIOR TO START OF WORK.

TEXAS ENGINEER FIRM REGISTRATION #F-15201

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JOB NO: 240460
DFT: EV
DSN:EV
CHK:WSA

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B/A Project No.: 23141

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Consultant Contact

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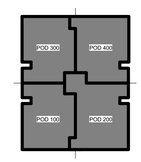
AUSTIN, TX 78759
Consultant Contact

KEYPLAN:



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Date Signed: 09.20.24

FILE:
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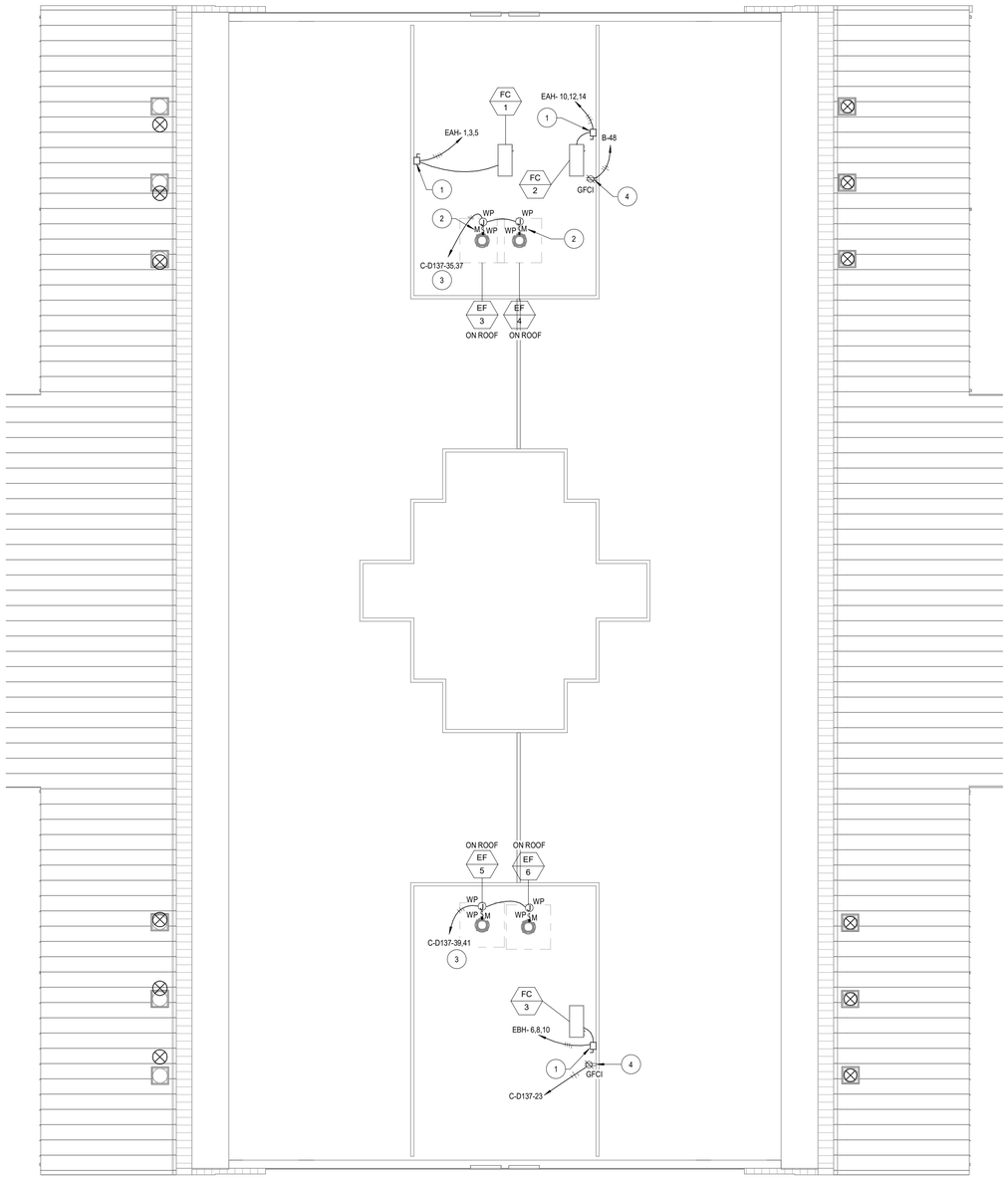
ISSUE:

POWER PLAN - LEVEL 1

Scale: AS NOTED

E3.1



1 POWER PLAN - LEVEL 2

SCALE: 1/8" = 1'-0"

GENERAL NOTES

A COORDINATION OF OVERCURRENT PROTECTIVE DEVICES SHALL BE BY ELECTRICAL CONTRACTOR AT THEIR OWN EXPENSE. INCLUDING SETTINGS OF CIRCUIT BREAKERS, FUSES AND GROUND FAULT DEVICES. CONTRACTOR SHALL PROVIDE COORDINATION STUDY AND SET ALL CIRCUIT PROTECTIVE DEVICE SETTINGS AS RECOMMENDED AT THE COMPLETION OF THE PROJECT.

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C IF GFCI RECEPTACLE IS NOT READILY ACCESSIBLE PER NEC 210.8, CONTRACTOR SHALL INSTALL GFCI BREAKER IN LIEU OF GFCI RECEPTACLE.

D DOORS INTO ELECTRIC PANEL ROOMS, ETC. SHALL BE MARKED WITH A SIGN STATING "ELECTRICAL ROOM" PER 2012 IFC 605.3.1. COORDINATE SIGN LOCATIONS WITH GENERAL CONTRACTOR PRIOR TO ORDERING. TYPICAL ALL BUILDINGS.

E ALL MATERIALS INSTALLED IN PLENUM SHALL BE APPROVED FOR THAT LOCATION AND PLENUM RATED. TYPICAL PER 2012 IMC 602 & 2011 NEC 300-22B.

F ROUTE ALL FEEDER AND BRANCH CIRCUITS FOR ROOF TOP EQUIPMENT TO UNDERSIDE OF ROOF DECK.

G COORDINATE WITH MECHANICAL DRAWINGS FOR EXACT LOCATION AND REQUIREMENTS OF MECHANICAL UNITS EQUIPMENT.

H ELECTRICAL CONTRACTOR SHALL FIELD VERIFY WITH OWNER ALL SWITCH AND OUTLET LOCATIONS PRIOR TO ROUGH-IN.

I ELECTRICAL BOXES IN FIRE RATED WALLS SHALL BE LISTED AND TESTED FOR USE IN FIRE RATED ASSEMBLIES IN ACCORDANCE WITH THEIR LISTING AND INSTRUCTIONS, AND SHALL COMPLY WITH THE REQUIREMENTS OF IBC 706.8.

KEYED NOTES

1 ELECTRICAL CONTRACTOR SHALL PROVIDE HD, NEMA-1, 30A/3P DISC. SWITCH. INSTALL RK5 FUSES PER MANUFACTURER RECOMMENDATION. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING.

2 PROVIDE 208V, 1PH, MOTOR-RATED SWITCH AS DISCONNECTING MEANS FOR EXHAUST FAN. SWITCH TO BE RATED FOR THE HORSEPOWER OF THE MOTOR. FIELD VERIFY LOCATION WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION ROUGH-IN.

3 CONTROLLED VIA DIGITAL TIMESWITCH THROUGH CONTACTOR. FANS SHALL RUN CONTINUOUS. REFER TO DETAIL ON SHEET E2.1.

4 ELECTRICAL CONTRACTOR SHALL PROVIDE IN-USE WEATHERPROOF RECEPTACLE PER NEC 406.9(B) WITH GFCI RECEPTACLE LOCATED WITHIN 25' OF EQUIPMENT PER NEC ARTICLE 210.63.

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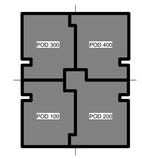

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STATE OF TEXAS
WILLARD SCOTT ALLRED
112067
LICENSED
PROFESSIONAL ENGINEER

Date Signed: 09.20.24

FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:

HVAC MEZZANINE POWER PLAN

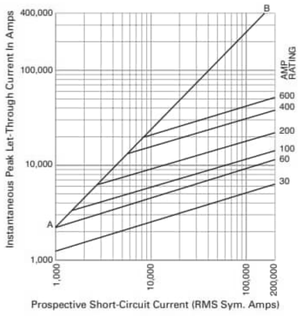
Scale: AS NOTED

E3.2

Class RK1 fuses — 250 V and 600 V

250 V LPN-RK-SP current-limiting, dual-element, time-delay fuse RMS let-through currents (kA)

Prosp. short C.C.	Fuse size (amps)					
	30	60	100	200	400	600
	IRMS	IRMS	IRMS	IRMS	IRMS	IRMS
1000	1	1	1	1	1	1
2000	1	1	2	2	2	2
3000	1	1	2	3	3	3
5000	1	2	2	3	5	5
FC-3 → 10,000	1	2	3	4	7	9
15,000	1	2	3	5	8	11
20,000	1	3	3	5	8	11
25,000	1	3	3	5	9	12
30,000	2	3	4	6	9	12
35,000	2	3	4	6	10	13
40,000	2	3	4	6	10	13
50,000	2	3	4	7	11	14
60,000	2	3	4	7	11	16
70,000	2	3	4	7	12	16
80,000	2	4	5	8	12	16
90,000	2	4	5	7	13	17
100,000	2	4	5	8	13	17
150,000	2	4	6	9	15	19
200,000	3	5	6	11	16	20
250,000	3	5	7	11	17	21
300,000	3	6	7	12	18	22



FUSE LET-THROUGH CHART

3-PHASE SHORT CIRCUIT CALCULATIONS BASED ON THE "POINT-BY-POINT" METHOD

I sca = Isc x M **M = 1/(1 + f)** **Cable: f = 1.73 x L x I / C x E** **Xfmr: f = Ip sc x Vp x 1.73(%Z)/100000 x KVA**

Is (sca) = Vp/Vs x M x Is

where:
I sc = the available short-circuit current, in amperes, at the beginning of the circuit.
L = the length of circuit to the fault, in feet.
C = the constant from Table C for the type of conductors and circuit arrangement. For parallel runs, multiply "C" value by the number of conductors per phase.
E = line-to-line voltage
Ip = primary current, in amperes.
Vp = primary line-to-line voltage of transformer, in volts.
Vs = secondary line-to-line voltage of transformer, in volts.
%Z = impedance of transformer.
* Use row 'cal' for feeder cables; and row 'xf' for transformers.

Fault Point	*	Description	Source Isc (amps)	Wire / Cable Size	No. of cond. per phase	Type of conduit	"C" value	E (volts)	L (length) in feet	XFMR. KVA	XFMR. %Z	Vp (volts)	Vs (volts)	f	M	Motor Contr. (A)	I sca (amps)
F1	ca	800A MAIN BREAKER	47600.00	#400 KCMIL AL	3	NM	18506	208	90					0.64	0.61		28992.60
	xf	FROM ENTERGY XFMR												0.00	1.00		0.00
F2	ca	400A DISCONNECT D1	28992.60	#600KCMIL CU	1	MAG	22965	208	10					0.11	0.90		26237.57
	xf													0.00	1.00		0.00
F3	ca	PANEL C-D137	28992.60	#1 CU	1	MAG	7293	208	15					0.50	0.67		19380.48
	xf													0.00	1.00		0.00
F4	ca	PANEL D-D137	28992.60	#600KCMIL CU	1	MAG	22965	208	15					0.16	0.86		25047.49
	xf													0.00	1.00		0.00
F5	ca	150A ATS - 2	25047.49	1/0 CU	1	MAG	8925	208	10					0.23	0.81		20307.34
	xf													0.00	1.00		0.00
F6	ca	PANEL EBH	20307.34	#1 CU	1	MAG	7293	208	20					0.46	0.68		13878.81
	xf													0.00	1.00		0.00
F7	ca	PANEL EB-D137	20307.34	#1 CU	1	MAG	7293	208	17					0.39	0.72		14570.69
	xf													0.00	1.00		0.00
F8	ca	400A DISCONNECT D2	28992.60	#600 KCMIL CU	1	NM	28033	208	140					1.20	0.45		13152.85
	xf													0.00	1.00		0.00
F9	ca	PANEL A	13152.85	#1 CU	1	MAG	7293	208	10					0.15	0.87		11437.24
	xf													0.00	1.00		0.00
F10	ca	PANEL B	13152.85	#600 KCMIL CU	1	MAG	22965	208	10					0.05	0.95		12554.79
	xf													0.00	1.00		0.00
F11	ca	150A ATS - 1	12554.79	#1/0 CU	1	MAG	8925	208	15					0.18	0.85		10680.39
	xf													0.00	1.00		0.00
F12	ca	PANEL EAH	10680.39	#1 CU	1	MAG	7293	208	20					0.24	0.80		8588.22
	xf													0.00	1.00		0.00
F13	ca	PANEL EA	10680.39	#10 CU	1	MAG	981	208	10					0.91	0.52		5604.96
	xf													0.00	1.00		0.00
	ca	FC-2	5604.96	#10 CU	1	MAG	981	208	13					0.62	0.62		3464.61
	xf													0.00	1.00		0.00
	ca	FC-3	13878.81	#6 CU	1	MAG	2425	208	18					0.86	0.54		7474.46
	xf													0.00	1.00		0.00
	ca	CU-2	5604.96	#4 CU	1	MAG	3806	208	30					0.37	0.73		4098.81
	xf													0.00	1.00		0.00
	ca	CU-3	13878.81	#10 CU	1	MAG	981	208	20					2.35	0.30		4138.73
	xf													0.00	1.00		0.00

Note: The above calculations neglected motor short-circuit contributions. If significant, motor short-circuit contribution may be added to the transformer secondary short-circuit current value. A practical estimate of motor contribution is to multiply the total motor load in amperes by 6. Lengths are for calculations only. DO NOT USE for estimating or take-off purposes.

→ SEE FUSE LET-THROUGH CHART THIS SHEET

1-PHASE, LINE-TO-LINE SHORT CIRCUIT CALCULATIONS BASED ON THE "POINT-BY-POINT" METHOD

I sca = Isc x M **M = 1/(1 + f)** **Cable: f = 2 x L x I / C x E** **Xfmr: f = Ip sc x Vp x %Z/100000 x KVA**

Is (sca) = Vp/Vs x M x Is

where:
I sc = the available short-circuit current, in amperes, at the beginning of the circuit.
L = the length of circuit to the fault, in feet.
C = the constant from Table C for the type of conductors and circuit arrangement. For parallel runs, multiply "C" value by the number of conductors per phase.
E = Line-to-line voltage or Line-to-ground voltage, where applicable.
Ip = primary current, in amperes.
Vp = primary line-to-line voltage of transformer, in volts.
Vs = secondary line-to-line voltage of transformer, in volts.
%Z = impedance of transformer.
* Use row 'cal' for feeder cables; and row 'xf' for transformers.

Fault Point	*	Description	Source Isc (amps)	Wire / Cable Size	No. of cond. per phase	Type of conduit	"C" value	E (volts)	L (length) in feet	XFMR. KVA	XFMR. %Z	Vp (volts)	Vs (volts)	f	M	I sca (amps)
	ca	FC-1	5604.96	#12 CU	1	MAG	617	208	10					0.87	0.53	2991.73
	xf													0.00	1.00	0.00
	ca	CU-1	5604.96	#12 CU	1	MAG	617	208	25					2.18	0.31	1760.51
	xf													0.00	1.00	0.00

Note: The above calculations neglected motor short-circuit contributions. If significant, motor short-circuit contribution may be added to the transformer secondary short-circuit current value. A practical estimate of motor contribution is to multiply the total motor load in amperes by 4. Lengths are for calculations only. DO NOT USE for cost estimating or take-off purposes.

PROVIDE APPROVED ARC-FLASH HAZARD WARNING ON ALL REQUIRED ELECTRICAL EQUIPMENT PER NEC 110.16

⚠ WARNING

Electric Arc Flash Hazard
Will cause severe injury or death

Wear proper protective equipment before opening or performing diagnostic measurements while energized. (See NFPA 70E)

ELECTRICAL LOAD CALCULATIONS - 800A SERVICE 208 /120V, 3PHASE, 4W

NEW & EXISTING LOADS:

PANEL C-D137	22.60	KVA
PANEL D-D137	122.20	KVA
PANEL A	20.20	KVA
PANEL B	92.40	KVA
NET TOTAL DEMAND LOAD:	**257.40**	KVA
AT 208/120V, 3-PHASE, 4-WIRE:	**714.49**	AMPS

ELECTRICAL LOAD CALCULATIONS - 200A GENERATOR 208 /120V, 3PHASE, 4W

NEW & EXISTING LOADS:

PANEL EA	0	KVA
PANEL EAH	21.50	KVA
PANEL EB-D137	23.80	KVA
PANEL EBH	9.70	KVA
NET TOTAL DEMAND LOAD:	**55.00**	KVA
AT 208/120V, 3-PHASE, 4-WIRE:	**152.67**	AMPS

GENERAL NOTES

A COORDINATION OF OVERCURRENT PROTECTIVE DEVICES SHALL BE BY ELECTRICAL CONTRACTOR AT THEIR OWN EXPENSE. INCLUDING SETTINGS OF CIRCUIT BREAKERS, FUSES AND GROUND FAULT DEVICES. CONTRACTOR SHALL PROVIDE COORDINATION STUDY AND SET ALL CIRCUIT PROTECTIVE DEVICE SETTINGS AS RECOMMENDED AT THE COMPLETION OF THE PROJECT.

B ALL CONDUIT AND CONDUCTORS ARE BASED ON COPPER CONDUCTORS IN EMT.

C ALL PANELS SHALL BE LABELED PER DETAIL 4/E5.1

D OPENINGS AROUND ELECTRICAL PENETRATIONS THROUGH FIRE-RATED WALLS, PARTITIONS, FLOORS, AND CEILINGS SHALL BE FIRE STOPPED USING APPROVED METHODS AND MATERIALS LISTED FOR THIS PURPOSE. REFER TO NEC ARTICLE 300.21 FOR REQUIREMENTS.

E 150KVA TRANSFORMERS SHALL COMPLY WITH 2011 NEC 450.21(B) EXCEPTION #2. TRANSFORMER SHALL BE RATED CLASS 155 OR HIGHER INSULATION SYSTEMS AND COMPLETELY ENCLOSED EXCEPT FOR VENTILATION OPENINGS.
5.150KVA TRANSFORMERS SHALL COMPLY WITH 2011 NEC 450.21(B) EXCEPTION #2. TRANSFORMER SHALL BE RATED CLASS 155 OR HIGHER INSULATION SYSTEMS AND COMPLETELY ENCLOSED EXCEPT FOR VENTILATION OPENINGS.

F CONCRETE ENCASED ELECTRODE (UFER) PER NEC 250.50 & 250-52(A)(3).

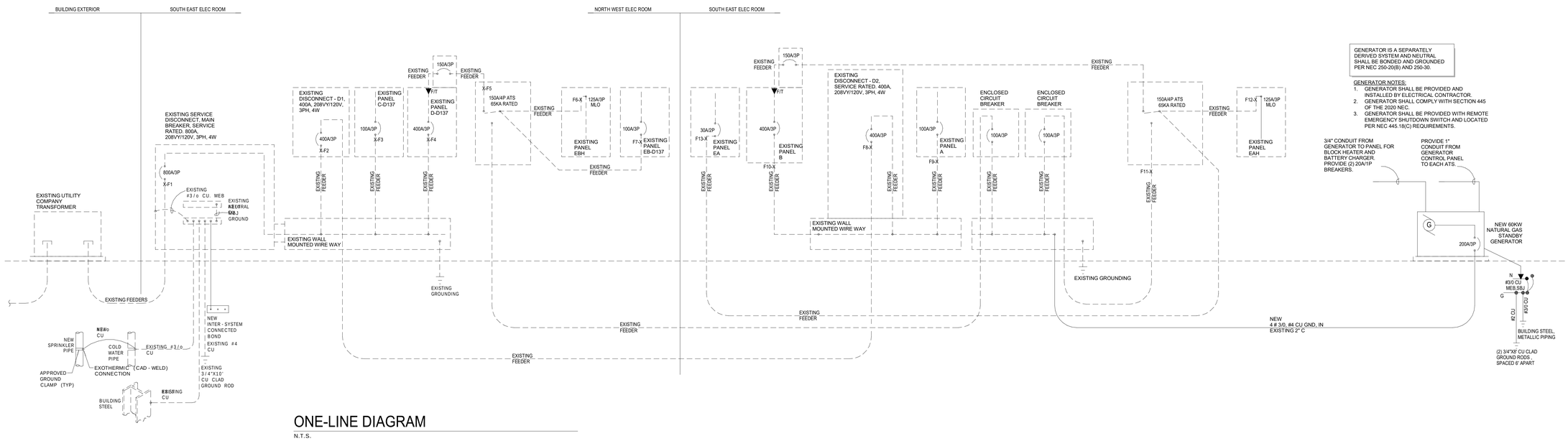
G NEW CIRCUIT BREAKER(S) IN S.E.S., SHALL MATCH MANUFACTURER'S IN PANELS FOR SERIES RATING PURPOSES.

H CONCRETE ENCASED ELECTRODE (UFER) PER NEC 250.50 & 250-52(A)(3).

I ELECTRICAL CONTRACTOR SHALL PROVIDE LABELING OF THE AVAILABLE FAULT CURRENT FOR EACH PANEL AS NOTED, PER NEC 110.24

J ELECTRICAL CONTRACTOR SHALL PROVIDE LABELING TO INDICATE WHERE EACH PIECE OF EQUIPMENT ORIGINATES, PER 408.4(B).

K ELECTRICAL CONTRACTOR SHALL FIELD VERIFY ALL PENETRATIONS/RACEWAYS FROM ELECTRICAL "SES" TO PANEL WILL BE SEALED IN ACCORDANCE TO NEC 300.5(G) & 225.27.



ONE-LINE DIAGRAM

N.T.S.

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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Structural Contact

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ASEI ENGINEERING
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MEP Contact

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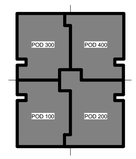
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE 200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

KEYPLAN:



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All reports, plans, specifications, computer files, field data, notes & other documents and instruments prepared by BRAVE / ARCHITECTURE as instruments of service shall remain the property of BRAVE / ARCHITECTURE. BRAVE / ARCHITECTURE shall retain all common law, statutory and other reserved rights, including the copyright thereto.

SEAL:

Date Signed: 09.20.24

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

SINGLE-LINE DIAGRAM/CALCS

Scale: AS NOTED

E4.1

EXISTING PANEL: A — ELECTRICAL PANELBOARD SCHEDULE

22K AIC FULLY RATED — **VOLTAGE:** 208VY/120V, 3Ø , 4W
LOCATION — **MAINS:** 100 AMP MCB
MOUNTING: SURFACE — **BUS:** 100 AMP COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
GENERAL USE RECEPTACLES				20	1	6.0				20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 1				**		7.5			2	***				RECEPTACLE SLEEPING 1
GENERAL USE RECEPTACLES				20	3		6.0			20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 2				**			7.5		4	***				RECEPTACLE SLEEPING 2
GENERAL USE RECEPTACLES				20	5			6.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 3				**				9.0	6	***				RECEPTACLE SLEEPING 3
GENERAL USE RECEPTACLES				20	7	6.0				20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 4				**		4.5			8	***				RECEPTACLE DAY ROOM 1
GENERAL USE RECEPTACLES				20	9		6.0			20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 5				**			9.0		10	***				RECEPTACLE OFFICES
SPARE				20	11			0.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
								4.5	12	***				RECEPTACLE
LIGHTING				20	13	1.9				20	12	12	3/4"	LIGHTING
DORM ROOM 1				**		0.0			14	***				DORM ROOM
LIGHTING				20	15		1.9			20	12	12	3/4"	GENERAL USE RECEPTACLES
DORM ROOM 2				**			6.0		16	***				GROUP ROOM
LIGHTING				20	17			1.9		20	12	12	3/4"	SPARE
DORM ROOM 3				**				4.5	18	***				MECHANICAL ROOM
BUSSED SPACE					19	0.0				20	12	12	3/4"	MISC
						5.0			20	***				EWC-B
LIGHTING	3/4"	12	12	20	21		2.1			20	12	12	3/4"	LIGHTING
OFFICE 1				**			2.1		22	***				OFFICE 2
SPARE				20	23			0.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
				**				1.5	24	***				STAFF TOILET
SPARE	3/4"	12	12	20	25	0.0				20	12	12	3/4"	RECEPTACLES/EQUIPMENT
				**		0.0			26	**				OFFICE/JANITOR
SPARE	3/4"	12	12	20	27		0.0			20	12	12	3/4"	RECEPTACLES/EQUIPMENT
				**			1.5		28	**				BATHROOM COUNTER
CONTINUOUS LOAD	3/4"	10	10	20	29			12.5		20	12	12	3/4"	RECEPTACLES/EQUIPMENT
GENERATOR BLOCK HEATER				***				8.3	30	GFCI	*			REFRIGERATOR
MISC	3/4"	10	10	20	31	5.0				20	12	12	3/4"	RECEPTACLES/EQUIPMENT
GENERATOR CONTROL PANEL				*		12.5			32	GFCI	*			COFFEE
CONTINUOUS LOAD	3/4"	10	10	20	33		5.0			20	12	12	3/4"	RECEPTACLES/EQUIPMENT
GENERATOR BATTERY CHARGER				***			12.5		34	GFCI	*			MICROWAVE
BUSSED SPACE					35			0.0		20	12	12	3/4"	MISC
								1.5	36	*FA				FLOW/TAMPER/BELL
BUSSED SPACE					37	0.0				20	12	12	3/4"	MISC
						1.5			38	*FA				FACP
BUSSED SPACE					39		0.0			20	12	12	3/4"	GENERAL USE RECEPTACLES
							4.5		40	*				FIRE ROOM CUSTODIAL A/C
BUSSED SPACE					41			0.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
								6.0	42	*				CONTROL ROOM GENERAL
AMPS PER PHASE (CONNECTED LOAD)						49.9	64.1	55.7						
3 PHASE DEMAND (VA)														

	0.0
LIGHTING @ 125%	1483.8
GENERAL USE RECEP'S, (1ST 10K @100%, REMAINDER @50%)	10400.0
RECEPTACLES/EQUIPMENT @100%	4180.0
CONTINUOUS LOAD @125%	2625.0
MISCELLANEOUS @100%	1560.0
NO KITCHEN	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
TOTAL VA	20248.8

20.2 KVA @ 208 Volt
56.2 Amps @ 208 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST

(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(*) NEW CIRCUIT BREAKER / NEW LOAD
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD

EXISTING PANEL: EAH (EMERGENCY) — ELECTRICAL PANELBOARD SCHEDULE

22K AIC FULLY RATED — **VOLTAGE:** 208VY/120V, 3Ø , 4W
LOCATION — **MAINS:** 125 AMP MLO
MOUNTING: SURFACE — **BUS:** 125 AMP COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
MECH	3/4"	12	12	15	1	10.1				20				SPARE
FC-1				*		0.0			2	***				
MECH			12	HACR	3		10.1			20				SPARE
CONT.							0.0		4	**				
MECH			12		5			10.1		25				SPARE
CONT.				3				0.0	6	**				
MECH	3/4"	12	12	20	7	11.4								SPARE
CU-1				*		0.0			8	2				
MECH			12	HACR	9		11.4			30	10	10	3/4"	MECH
CONT.				2			16.7		10	*				FC-2
BUSSED SPACE					11			0.0	HACR	10				MECH
								16.7	12					CONT.
BUSSED SPACE					13	0.0				10				MECH
						16.7			14	3				CONT.
BUSSED SPACE					15		0.0							SPARE
							0.0		16	**				
RECEPTACLES/EQUIPMENT	3/4"	10	10	30	17			18.3	HACR					SPARE
IT RACK 30A				*				0.0	18					
RECEPTACLES/EQUIPMENT	3/4"	12	12	20	19	15.0								SPARE
IT RACK 20A				*		0.0			20	3				
RECEPTACLES/EQUIPMENT	3/4"	12	12	20	21		1.5			20				MOTOR
SECURITY CABINET				*			1.5		22	**				WATER HEATER CONTROL
BUSSED SPACE					23			0.0		20				LIGHTING
								4.0	24	**				BATHROOMS
BUSSED SPACE					25	0.0				20				RECEPTACLES/EQUIPMENT
						1.5			26	**				WH RECIRCULATION PUMP
BUSSED SPACE					27		0.0			20				MOTOR
							9.8		28	**				SF-D1
BUSSED SPACE					29			0.0		20				RECEPTACLES/EQUIPMENT
								1.5	30	**				FURNACE CONTROL
BUSSED SPACE					31	0.0				20				MOTOR
						5.8			32	**				EF-D1
BUSSED SPACE					33		0.0			20	12	12	3/4"	LIGHTING
							4.1		34	**				CORRIDOR GENERAL
BUSSED SPACE					35			0.0		20	12	12	3/4"	LIGHTING
								2.8	36	**				CONTROL ROOM
BUSSED SPACE					37	0.0				20	12	12	3/4"	GENERAL USE RECEPTACLES
						3.0			38	*				
BUSSED SPACE					39		0.0			20	12	12	3/4"	MISC
							4.5		40	*				ACCESS CONTROL / CARD...
BUSSED SPACE					41			0.0						BUSSED SPACE
								0.0	42					
AMPS PER PHASE (CONNECTED LOAD)						63.5	59.6	53.4						
3 PHASE DEMAND (VA)														

	0.0
LIGHTING @ 125%	1638.8
GENERAL USE RECEP'S, (1ST 10K @100%, REMAINDER @50%)	360.0
RECEPTACLES/EQUIPMENT @100%	4540.0
	0.0
MISCELLANEOUS @100%	540.0
NO KITCHEN	0.0
	0.0
	0.0
MECHANICAL	12384.0
	0.0
MOTOR @100%	2052.0
TOTAL VA	21514.8

21.5 KVA @ 208 Volt
59.8 Amps @ 208 Volt (CODE LOAD)

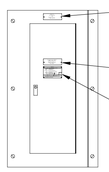
CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST

(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(*) NEW CIRCUIT BREAKER / NEW LOAD
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD

LABELS TO BE PROVIDED:

1. PHENOLIC TAG INDICATING PANEL NAME, SOURCE PANEL, VOLTAGE/PHASE, AND ELECTRICAL BRANCH OF THE ELECTRICAL SYSTEM.
2. PHENOLIC TAG INDICATING THE AVAILABLE FAULT CURRENT AT PANEL, EQUIPMENT BRACING RATING, AND DATE SHORT CIRCUIT CALCULATION PERFORMED.
3. PHENOLIC TAG OR STICKER PROVIDING ARC FLASH HAZARD INFORMATION, INCLUDING FLASH HAZARD BOUNDARY, INCIDENT ENERGY AT INDICATED DISTANCE, PPE CATEGORY PER NFPA 70E, VOLTAGE OF PANEL TO INDICATE SHOCK HAZARD, AND LIMIT, RESTRICTED, AND PROHIBITED APPROACH DISTANCES PER NFPA 70E.



PANEL "P1"
FED FROM PANEL
"SES"
208V/120V, 3Ø, 4W
NORMAL BRANCH

AVAILABLE FAULT CURRENT:
##,###A SYMMETRICAL
EQUIPMENT BRACED AT:
42,000A SYMMETRICAL
DATE 7/26/16

WARNING
ARC FLASH AND SHOCK HAZARD

18 INCHES	FLASH HAZARD BOUNDARY
1.2 CAL/CM²	FLASH HAZARD AT 18
CATEGORY 0	PPE CATEGORY PER NFPA 70E
480 VAC	SHOCK HAZARD WHEN COVER IS OPEN
42 INCHES	LIMITED APPROACH
12 INCHES	RESTRICTED APPROACH PER NFPA 70E
1 INCH	PROHIBITED APPROACH

CATEGORY 0

PANEL "P1" DATE 7/26/16

NOTE: CHANGES IN EQUIPMENT SETTINGS OR SYSTEM CONFIGURATION MAY INVALIDATE THE CALCULATED VALUES AND PPE REQUIREMENTS LISTED ABOVE.

NOTES:

1. ARC FLASH HAZARD INFORMATION AND FAULT CURRENT VALUES SHALL BE DETERMINED BY MANUFACTURERS ARC FLASH STUDY. SHORT CIRCUIT ANALYSIS, AND COORDINATION STUDY.
2. OF ARC FLASH STUDY DETERMINES THAT THE INCIDENT ENERGY AT THE EQUIPMENT IS >40 CAL/CM². THE ARC FLASH STICKER OR PHENOLIC TAG SHALL BE PROVIDED WITH A RED BACKGROUND AND HAVE THE WORD "DANGER" INCLUDED IN THE TAG.
3. REFER TO SPECIFICATIONS FOR BACKGROUND AND TEXT COLORS, FONT SIZE, AND ANY ADDITIONAL INFORMATION.
4. DISTRIBUTION EQUIPMENT SHALL BE LABELED IN ACCORDANCE WITH 2011 NEC SECTIONS 110.16 AND 110.24.

1 TYPICAL PANEL LABELING DETAIL
SCALE: NOT TO SCALE

EXISTING PANEL: B — ELECTRICAL PANELBOARD SCHEDULE

22K AIC FULLY RATED — **VOLTAGE:** 208VY/120V, 3Ø , 4W
LOCATION — **MAINS:** 400 AMP MCB
MOUNTING: SURFACE — **BUS:** 400 AMP COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
SPARE				80	1	0.0				80				SPARE
				***		0.0			2	***				
SPARE					3		0.0							SPARE
							0.0		4					
SPARE					5			0.0						SPARE
				3				0.0	6	3				
GENERAL USE RECEPTACLES				20	7	6.0				100				SPARE
EXISTING 1				**		0.0			8	**				
GENERAL USE RECEPTACLES				20	9		6.0							SPARE
EXISTING 2				**			0.0		10					
GENERAL USE RECEPTACLES				20	11			6.0						SPARE
EXISTING 3				**				0.0	12	3				
BUSSED SPACE					13	3.3								BUSSED SPACE
						0.0			14					
BUSSED SPACE					15		3.3							BUSSED SPACE
							0.0		16					
GENERAL USE RECEPTACLES				20	17			6.0						BUSSED SPACE
EXISTING 4				**				0.0	18					
GENERAL USE RECEPTACLES				20	19	6.0				20				SPARE
EXISTING 5				**		0.0			20	***				
SPARE				30	21		0.0			30				SPARE
				***			0.0		22	***				
MISC				15	23			10.0		15				MISC
WASHER				**				10.0	24	**				WASHER
MISC					25	10.0								MISC
CONT.						10.0			26					CONT.
MISC					27		10.0							MISC
CONT.				3			10.0		28	3				CONT.
BUSSED SPACE					29			0.0		30				SPARE
								0.0	30	**				
MISC	1 1/2"	8	1	100	31	58.3				100				MISC
DRYER				**		58.3			32	**				DRYER
MISC					33		58.3							MISC
CONT.							58.3		34					CONT.
MISC					35			58.3						MISC
CONT.				3				58.3	36	3				CONT.
SPARE				25	37	0.0				25				MISC
				**		20.0			38	**				UNLABELED
SPARE				GFCI	39		0.0			GFCI				MISC
							20.0		40	2				UNLABELED
SPARE					41			0.0		25				SPARE
				3				0.0	42	**				
MECH (LARGEST)	1"	10	4	60	43	45.0				GFCI				SPARE
CU-2				*		0.0			44					
MECH (LARGEST)			4	HACR	45		45.0							SPARE
CONT.							0.0		46	3				
MECH (LARGEST)			4		47			45.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
CONT.				3				1.5	48	*				MEZZANINE MAINTENANCE
AMPS PER PHASE (CONNECTED LOAD)						217.0	211.0	195.2						
3 PHASE DEMAND (VA)														

FEED THROUGH LOAD PANEL EAH & EA	14418.8
	0.0
GENERAL USE RECEP'S, (1ST 10K @100%, REMAINDER @50%)	3780.0
	0.0
	0.0
MISCELLANEOUS @100%	54000.0
NO KITCHEN	0.0
	0.0
LARGEST MECHANICAL @125%	20250.0
	0.0
	0.0
	0.0
TOTAL VA	92448.8

92.4 KVA @ 208 Volt
256.8 Amps @ 208 Volt (CODE LOAD)

B
ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST

(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(*) NEW CIRCUIT BREAKER / NEW LOAD
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD
(LC) VIA LIGHTING CONTACTOR

EXISTING PANEL: EA — ELECTRICAL PANELBOARD SCHEDULE

10K AIC FULLY RATED — **VOLTAGE:** 240VY/120V, 1Ø , 3W
LOCATION — **MAINS:** 30 AMP MCB
MOUNTING: SURFACE — **BUS:** 100 AMP COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD AMPS PHASE A	PHASE B	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
SPARE				20	1	0.0			20				SPARE
				**		0.0		2	**				
SPARE				20	3		0.0		20				SPARE
				**			0.0	4	**				
SPARE				20	5	0.0			20				SPARE
				**		0.0		6	**				
BUSSED SPACE					7		0.0						BUSSED SPACE
							0.0	8					
BUSSED SPACE					9	0.0							BUSSED SPACE
						0.0		10					
BUSSED SPACE					11		0.0						BUSSED SPACE
							0.0	12					
AMPS PER PHASE (CONNECTED LOAD)						0.0	0.0						
1 PHASE DEMAND (VA)													

	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
NO KITCHEN	0.0
	0.0
	0.0
	0.0
	0.0
	0.0
TOTAL VA	0.0

0.0 KVA @ 240 Volt
0.0 Amps @ 240 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST

(MCB) MAIN CIRCUIT BREAKER
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD

A	B
EAH	EA

JC DIVERSION CENTER RENOVATION

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B/A Project No.: 23141

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Civil Contact

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KW LANDSCAPE ARCHITECTS
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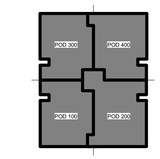
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

KEYPLAN:



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SEAL:

Date Signed: 09.20.24

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

PANELBOARD SCHEDULES

Scale: AS NOTED

E6.1

EXISTING PANEL: C-D137 — ELECTRICAL PANELBOARD SCHEDULE

LOCATION — **MOUNTING: SURFACE**

22K AIC FULLY RATED — **VOLTAGE: 208VY/120V, 3Ø , 4W** — **MAINS: 100 AMP** MCB — **BUS: 100 AMP** COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
GENERAL USE RECEPTACLES				20	1	6.0				20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 1				**		7.5			2	***				RECEPTACLE SLEEPING 1
GENERAL USE RECEPTACLES				20	3		6.0			20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 2				**			7.5		4	***				RECEPTACLE SLEEPING 2
GENERAL USE RECEPTACLES				20	5			6.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 3				**				9.0	6	***				RECEPTACLE SLEEPING 3
GENERAL USE RECEPTACLES				20	7	6.0				20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 4				**		6.0			8	***				RECEPTACLE DAY ROOM
GENERAL USE RECEPTACLES				20	9		6.0			20	12	12	3/4"	GENERAL USE RECEPTACLES
RECEPTACLE 5				***			9.0		10	***				RECEPTACLE OFFICES
SPARE				20	11			0.0		20	12	12	3/4"	GENERAL USE RECEPTACLES
				**				0.0	12	***				GROUP ROOM GENERAL
LIGHTING				20	13	1.9				20	12	12	3/4"	LIGHTING
DORM ROOM 1				**		3.2			14	***				DORM ROOM
LIGHTING				20	15		1.9			20	12	12	3/4"	RECEPTACLES/EQUIPMENT
DORM ROOM 2				**			4.5		16	***				MECHANICAL ROOM
LIGHTING				20	17			1.9		20				SPARE
DORM ROOM 3				**				0.0	18	***				
BUSSED SPACE					19	0.0				20	12	12	3/4"	MISC
						5.0			20	GFCI	*			ELECTRIC DRINKING FOUNTAIN
LIGHTING				20	21		2.1			20	12	12	3/4"	LIGHTING
OFFICE				**			2.6		22	**				OFFICE
GENERAL USE RECEPTACLES	3/4"	12	12	20	23			0.0		20	10	10	3/4"	LIGHTING
MEZZANINE MAINTENANCE				***				0.0	24	***LC				MONUMENTS SIGN
SPARE				20	25	0.0				20	12	12	3/4"	RECEPTACLES/EQUIPMENT
				**		7.5			26	***				OFFICE/JANITOR
SPARE				20	27		0.0			20	12	12	3/4"	RECEPTACLES/EQUIPMENT
				**			8.3		28	GFCI	*			REFRIGERATOR
MISC	3/4"	12	12	20	29			1.5		20	12	12	3/4"	RECEPTACLES/EQUIPMENT
TIME CLOCK				***				12.5	30	GFCI	*			COFFEE
MOTOR	3/4"	12	12	15	31	0.2				20	12	12	3/4"	RECEPTACLES/EQUIPMENT
EF-1				*		12.5			32	GFCI	*			MICROWAVE
MOTOR	3/4"	12	12	15	33		0.2			20	12	12	3/4"	GENERAL USE RECEPTACLES
EF-2				*			1.5		34	*				BATHROOM SINK
MOTOR	3/4"	12	12	15	35			3.8		20	12	12	3/4"	RECEPTACLES/EQUIPMENT
EF-3 & EF-4				*				8.3	36	*GFCI				CONTROL - REFRIGERATOR
MOTOR			12	LC	37	3.8				20	12	12	3/4"	RECEPTACLES/EQUIPMENT
CONT.				2		12.5			38	*GFCI				CONTROL - MICROWAVE
MOTOR	3/4"	12	12	15	39		3.8			20	12	12	3/4"	RECEPTACLES/EQUIPMENT
EF-5 & EF-6				*			12.5		40	*GFCI				CONTROL - COFFEE
MOTOR			12	LC	41			3.8						BUSSED SPACE
CONT.				2				0.0	42					
AMPS PER PHASE (CONNECTED LOAD)						72.1	65.9	46.8						

3 PHASE DEMAND (VA)

	0.0
LIGHTING @ 125%	2034.5
GENERAL USE RECEP'S, (1ST 10K @100%, REMAINDER @50%)	8460.0
RECEPTACLES/EQUIPMENT @100%	9440.0
	0.0
MISCELLANEOUS @100%	780.0
NO KITCHEN	0.0
	0.0
	0.0
	0.0
	0.0
MOTOR @100%	1872.0
TOTAL VA	22586.5

22.6 KVA @ 208 Volt
62.7 Amps @ 208 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST
(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD
(LC) VIA LIGHTING CONTACTOR

EXISTING PANEL: D-D137 — ELECTRICAL PANELBOARD SCHEDULE

LOCATION — **MOUNTING: SURFACE**

65K AIC/22K AIC SERIE... — **VOLTAGE: 208VY/120V, 3Ø , 4W** — **MAINS: 400 AMP** MCB — **BUS: 400 AMP** COPPER — FEED THROUGH LUGS

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
MECH				80	1	48.1				60	4	10	1"	MECH
EXSTING CU				**		45.0			2	*				CU-3
MECH					3		48.1				4			MECH
CONT.							45.0		4					CONT.
MECH					5			48.1			4			MECH
CONT.				3				45.0	6	3				CONT.
MISC				100	7	58.3				100				MISC
DRYER				**		58.3			8	**				DRYER
MISC					9		58.3							MISC
CONT.							58.3		10					CONT.
MISC					11			58.3						MISC
CONT.				3				58.3	12	3				CONT.
GENERAL USE RECEPTACLES				20	13	6.0				20				SPARE
EXISTING				**		0.0			14	**				
GENERAL USE RECEPTACLES				20	15		6.0			20				SPARE
EXISTING				**			0.0		16	**				
GENERAL USE RECEPTACLES				20	17			6.0		20				SPARE
EXISTING				**				0.0	18	**				
GENERAL USE RECEPTACLES				20	19	6.0				20				SPARE
EXISTING				**		0.0			20	**				
GENERAL USE RECEPTACLES				30	21		6.0			30				RECEPTACLES/EQUIPMENT
EXISTING				**			16.7		22	**				
MISC				15	23			10.0		15	12	12	3/4"	MISC
WASHER				**				10.0	24	**				WASHER
MISC				25	10.0					25	12			MISC
CONT.					10.0				26					CONT.
MISC				27		10.0				25	12			MISC
CONT.				3		10.0			28	3				CONT.
MOTOR				20	29			3.0		20	12	12	3/4"	RECEPTACLES/EQUIPMENT
CIRC PUMP				**				0.0	30	**				
KITCHEN	3/4"	12	12	20	31	1.5				100				SPARE
WATER HEATER CONTROL				**		0.0			32	**				
KITCHEN	3/4"	12	12	20	33		1.5							SPARE
WATER HEATER PUMP				**			0.0		34					
BUSSED SPACE					35			0.0						SPARE
								0.0	36	3				
MECH	3/4"	10	10	25	37	0.0				25	10	10	3/4"	MECH
				**		0.0			38	**				
MECH				GFCI	39		0.0			GFCI				MECH
							0.0		40					
MECH					41			0.0						MECH
				3				0.0	42	3				
AMPS PER PHASE (CONNECTED LOAD)						243.3	259.9	238.8						

3 PHASE DEMAND (VA)

FEED THROUGH LOAD — PANELS EBH & EB-D137	33509.3
	0.0
GENERAL USE RECEP'S, (1ST 10K @100%, REMAINDER @50%)	3600.0
RECEPTACLES/EQUIPMENT @100%	2000.0
	0.0
MISCELLANEOUS @100%	49200.0
NO KITCHEN	0.0
	0.0
	0.0
MECHANICAL	33516.0
	0.0
MOTOR @100%	360.0
TOTAL VA	122185.3

122.2 KVA @ 208 Volt
339.4 Amps @ 208 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST
(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD

EXISTING PANEL: EB-D137 (EMERGENCY) — ELECTRICAL PANELBOARD SCHEDULE

LOCATION — **MOUNTING: SURFACE**

22K AIC FULLY RATED — **VOLTAGE: 208VY/120V, 3Ø , 4W** — **MAINS: 100 AMP** MCB — **BUS: 100 AMP** COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
LIGHTING	3/4"	10	10	20	1	4.3								BUSSED SPACE
BUILDING LIGHT			LC	***		0.0			2					
LIGHTING	3/4"	10	10	20	3		4.3							BUSSED SPACE
BUILDING LIGHT			LC	***			0.0		4					
LIGHTING	3/4"	12	12	20	5			0.0						BUSSED SPACE
MECHANICAL ROOM				***				0.0	6					
SPARE				20	7	0.0								BUSSED SPACE
				**		0.0			8					
LIGHTING	3/4"	10	10	20	9		3.4							BUSSED SPACE
Site Pole				***			0.0		10					
LIGHTING			10		11			3.4						BUSSED SPACE
Cont.				2				0.0	12					
SPARE				20	13	0.0								BUSSED SPACE
				**		0.0			14					
MOTOR				40	15		25.0			40				MOTOR
SSF-D3				**			25.0		16	**				SSF-D4
MOTOR					17			25.0						MOTOR
SSF-D3								25.0	18					SSF-D4
MOTOR					19	25.0								MOTOR
SSF-D3				3		25.0			20	3				SSF-D4
MOTOR				20	21		4.8			15				MOTOR
SEF-D3				**			4.8		22	**				SEF-D4
MOTOR					23			4.8						MOTOR
SEF-D3								4.8	24					SEF-D4
MOTOR					25	4.8								MOTOR
DSEF-D3				3		4.8			26	3				SEF-D4
BUSSED SPACE					27		0.0			20				SPARE
							0.0		28	**				
BUSSED SPACE					29			0.0						BUSSED SPACE
								0.0	30					
BUSSED SPACE					31	0.0								BUSSED SPACE
						0.0			32					
BUSSED SPACE					33		0.0							BUSSED SPACE
							0.0		34					
BUSSED SPACE					35			0.0						BUSSED SPACE
								0.0	36					
BUSSED SPACE					37	0.0								BUSSED SPACE
						0.0			38					
BUSSED SPACE					39		0.0							BUSSED SPACE
							0.0		40					
BUSSED SPACE					41			0.0						BUSSED SPACE
								0.0	42					
AMPS PER PHASE (CONNECTED LOAD)						63.9	67.3	63.0						

3 PHASE DEMAND (VA)

	0.0
LIGHTING @ 125%	2307.5
	0.0
	0.0
	0.0
	0.0
NO KITCHEN	0.0
	0.0
	0.0
	0.0
	0.0
MOTOR @100%	21456.0
TOTAL VA	23763.5

23.8 KVA @ 208 Volt
66.0 Amps @ 208 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST
(MLO) MAIN LUGS ONLY
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(LC) VIA LIGHTING CONTACTOR

EXISTING PANEL: EBH (EMERGENCY) — ELECTRICAL PANELBOARD SCHEDULE

LOCATION — **MOUNTING: SURFACE**

22K AIC FULLY RATED — **VOLTAGE: 208VY/120V, 3Ø , 4W** — **MAINS: 125 AMP** MLO — **BUS: 125 AMP** COPPER

LOAD DESCRIPTION	CO...	CU GR...	PHASE NEUT	CKT BRKR	CIR NO.	LOAD... PHASE A	PHASE B	PHASE C	CIR NO.	CKT BRKR	PHASE NEUT	CU GR...	CO...	LOAD DESCRIPTION
BUSSED SPACE					1	0.0				20	12	12	3/4"	SPARE
						0.0			2	***				
BUSSED SPACE					3		0.0			20				SPARE
							0.0		4	***				
BUSSED SPACE					5			0.0		30	10	10	3/4"	MECH
								16.7	6	*				FC-3
MISC	3/4"	12	12	20	7	3.0				HACR	10			MECH
DOOR ACCESS / CARD READER				*		16.7			8					GAS FURNACE
BUSSED SPACE					9		0.0			10				MECH
							16.7		10	3				CONT.
BUSSED SPACE					11			0.0		20				MECH
								6.0	12	**				EXISTING AHU D4
BUSSED SPACE					13	0.0				HACR				MECH
						6.0			14					CONT.
BUSSED SPACE					15		0.0							MECH
							6.0		16	3				CONT.
BUSSED SPACE					17			0.0		20	12	12	3/4"	LIGHTING
								4.1	18	***				UNIT 2 CORIDOR LIGHTS
BUSSED SPACE					19	0.0				20	12	12	3/4"	LIGHTING
						4.0			20	***				TOILET LIGHTS
BUSSED SPACE					21		0.0			20				SPARE
							0.0		22	***				
BUSSED SPACE					23			0.0						BUSSED SPACE
								0.0	24					
BUSSED SPACE					25	0.0								BUSSED SPACE
						0.0			26					
BUSSED SPACE					27		0.0							BUSSED SPACE
							0.0		28					
BUSSED SPACE					29			0.0						BUSSED SPACE
								0.0	30					
BUSSED SPACE					31	0.0								BUSSED SPACE
						0.0			32					
BUSSED SPACE					33		0.0							BUSSED SPACE
							0.0		34					
BUSSED SPACE					35			0.0						BUSSED SPACE
								0.0	36					
BUSSED SPACE					37	0.0								BUSSED SPACE
						0.0			38					
BUSSED SPACE					39		0.0							BUSSED SPACE
							0.0		40					
BUSSED SPACE					41			0.0						BUSSED SPACE
								0.0	42					
AMPS PER PHASE (CONNECTED LOAD)						29.7	22.7	26.8						

3 PHASE DEMAND (VA)

	0.0
LIGHTING @ 125%	1213.8
	0.0
	0.0
	0.0
MISCELLANEOUS @100%	360.0
NO KITCHEN	0.0
	0.0
	0.0
MECHANICAL	8172.0
	0.0
	0.0
TOTAL VA	9745.8

9.7 KVA @ 208 Volt
27.1 Amps @ 208 Volt (CODE LOAD)

CONTRACTOR TO INSTALL APPROVED HANDLE TIE ON ALL SHARED NEUTRAL CIRCUITS.

SYMBOL LIST
(MCB) MAIN CIRCUIT BREAKER
(FA) PROVIDE HANDLE LOCK-ON DEVICE & PAINT RED
(EM) PROVIDE UN-SWITCHED HOTLEG TO BATT/CHR.
(**) EXIST CIRCUIT BREAKER / EXISTING LOAD
(***) EXIST CIRCUIT BREAKER / NEW LOAD

C-D137	D-D137
EB-D137	EBH

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

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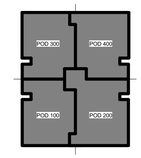
KEYPLAN:



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SEAL:

FILE:
DRAWN BY: -
CHECKED BY: -

ISSUE:

PANELBOARD SCHEDULES

Scale: AS NOTED

E6.2

COMcheck Software Version COMcheckWeb
Interior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: Jefferson County Diversion Center
Project Type: New Construction

Construction Site:
Beaumont, Texas

Owner/Agent:

Designer/Contractor:
Eric Voss
ASEI Engineering Inc.
350 Glenborough Dr. #270
Houston, Texas 77067
713-300-9579

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts
1-Courthouse/Police Station/Penitentiary:Confinement Cell	2454	0.81	1988
2-Courthouse/Police Station/Penitentiary:Penitentiary Dining Area	1810	0.42	760
3-Common Space Types:Corridor/Transition <8 ft wide	1328	0.71	943
4-Common Space Types:Restrooms	1106	0.63	697
5-Common Space Types:Conference/Meeting/Multipurpose	10302	0.97	9993
		Total Allowed Watts =	14381

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
1-Courthouse/Police Station/Penitentiary:Confinement Cell				
LED: H: LINEAR LED: Other:	1	32	20	640
LED: E: BED LIGHT LED: Other:	1	32	4	128
2-Courthouse/Police Station/Penitentiary:Penitentiary Dining Area				
LED: C2: 2IN LED DOWN LIGHT: Other:	1	4	14	54
LED: C4: 4IN LED DOWN LIGHT: Other:	1	16	12	195
LED: H: LINEAR LED: Other:	1	12	20	240
LED: K: DRUM: Other:	1	2	70	140
3-Common Space Types:Corridor/Transition <8 ft wide				
LED: H: LINEAR LED: Other:	1	18	20	360
4-Common Space Types:Restrooms				
LED: C4: 4IN DOWN LIGHT: Other:	1	20	12	244
LED: F: COVE LIGHT LED: Other:	1	2	63	126
LED: B: 2X2 LED: Other:	1	1	34	34
LED: Q: LED STRIP LIGHT: Other:	1	6	31	186
5-Common Space Types:Conference/Meeting/Multipurpose				
LED: A: 2X4 LED: Other:	1	8	36	288
LED: B: 2X2 LED: Other:	1	22	34	748
LED: C4: 4IN LED DOWN LIGHT: Other:	1	6	12	73
LED: Q: LED STRIP LIGHT: Other:	1	9	31	279
			Total Proposed Watts =	3736

Interior Lighting PASSES: Design 74% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2021 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

ERIC VOSS — Name - Title
Signature
09.20.24 — Date

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
Page 2 of 8

COMcheck Software Version COMcheckWeb
Exterior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: Jefferson County Diversion Center
Project Type: New Construction
Exterior Lighting Zone 3 (Other (LZ3))

Construction Site:
Beaumont, Texas

Owner/Agent:

Designer/Contractor:
Eric Voss
ASEI Engineering Inc.
350 Glenborough Dr. #270
Houston, Texas 77067
713-300-9579

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts /	D Tradable Wattage	E Allowed Watts (B X C)
Entry canopy	1400 ft2	0.4	Yes	560
Parking area	3209 ft2	0.06	Yes	193
			Total Tradable Watts (a) =	1288
			Total Allowed Watts =	1288
			Total Allowed Supplemental Watts (b) =	500

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.
(b) A supplemental allowance equal to 500 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
Entry canopy (1400 ft2): Tradable Wattage				
LED: L: SURFACE LED: Other:	1	12	26	312
LED: M: WALL PACK LED: Other:	1	12	40	480
LED: P: WALL SCONCE: Other:	1	14	17	238
Parking area (3209 ft2): Tradable Wattage				
LED: R: POLE LIGHT: Other:	1	3	136	409
Landscaping (2740 ft2): Tradable Wattage				
Driveway (7100 ft2): Tradable Wattage				
			Total Tradable Proposed Watts =	1439

Exterior Lighting PASSES: Design 20% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 2021 IECC requirements in COMcheck Version COMcheckWeb and to comply with any applicable

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
Page 3 of 8

mandatory requirements listed in the Inspection Checklist.

ERIC VOSS — Name - Title
Signature
09.20.24 — Date

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
Page 4 of 8

COMcheck Software Version COMcheckWeb
Inspection Checklist

Energy Code: 2021 IECC

Requirements: 76.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** E2.1
C103.2 [PR8][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** E1.1 & E2.1
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
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Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.3.1 [EL22][1]	Spaces required to have light-reduction controls have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern >= 50 percent.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Areas such as security or emergency areas that need continuous lighting. **Location on plans/spec:** E2.1
C405.2.1, C405.2.1.1 [EL18][1]	Occupancy sensors installed in classrooms/lecture/training rooms, conference/meeting/multipurpose rooms, copy/print rooms, lounges/breakrooms, enclosed offices, open plan office areas, restrooms, storage rooms, locker rooms, corridors, warehouse storage areas, and other spaces <= 300 sqft that are enclosed by floor-to-ceiling height partitions. Reference section language C405.2.1.2 for control function in warehouses and section C405.2.1.3 for open plan office spaces.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C405.2.1.2 [EL19][1]	Occupancy sensors control function in warehouses: In warehouses, the lighting in aisleways and open areas is controlled with occupant sensors that automatically reduce lighting power by 50% or more within 20 minutes of when the areas are unoccupied. The occupant sensors control lighting in each aisleway independently and do not control lighting beyond the aisleway being controlled by the sensor. Lights not turned off by occupant sensors is done so by time-switch.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. **Location on plans/spec:** E2.1
C405.2.1.3 [EL20][1]	Occupant sensor control function in open plan office areas: Occupant sensor controls in open office spaces >= 300 sq.ft. have controls 1) configured so that general lighting can be controlled separately in control zones with floor areas <= 600 sq.ft. within the space, 2) general lighting in each zone permitted to turn on upon occupancy in control zone, 3) automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the space, 4) are configured so that general lighting power in each control zone is reduced by >= 80% of the full zone general lighting power within 20 minutes of all occupants leaving that control zone.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** E2.1
C405.2.2, C405.2.2.1 [EL21][1]	Each area not served by occupancy sensors (per C405.2.1.1) have time-switch controls and functions detailed in sections C405.2.2.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Areas such as security or emergency areas that need continuous lighting. **Location on plans/spec:** E2.1

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
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Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.4, C405.2.4.1, C405.2.4.2 [EL23][1]	Daylight zones provided with individual controls that control the lights independent of general area lighting. See code section C405.2.3 Daylight-responsive controls for applicable spaces. C405.2.3.1 Daylight responsive control function and section C405.2.3.2 Sidelit zone.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. **Location on plans/spec:** E2.1
C405.2.5 [EL27][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** E2.1
C405.2.7 [EL28][1]	Automatic lighting controls for exterior lighting installed. Controls will be daylight controlled, set based on business operation time-of-day, or reduce connected lighting > 30%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Emergency lighting normally auto controlled to off during building operation, safety requirements, or decorative gas lighting. **Location on plans/spec:** E1.1 & E2.1
C405.7 [EL26][1]	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.8 [EL27][1]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.9.1, C405.9.2 [EL28][1]	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.10 [EL29][1]	Total voltage drop across the combination of feeders and branch circuits <= 5%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.1.1 [EL30][1]	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy >= 65 lm/W or luminaires with efficacy >= 45 lm/W or comply with C405.2.4 or C405.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.11, C405.11.1 [EL31][1]	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and > 25% of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
Page 7 of 8

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17][1]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.5.1 [FI19][1]	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Exterior Lighting fixture schedule for values.*
C408.1.1 [FI57][1]	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5 [FI16][1]	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI33][1]	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Project Title: Jefferson County Diversion Center
Data filename:
Report date: 09/05/24
Page 8 of 8

JC DIVERSION CENTER RENOVATION

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B/A Project No.: 23141

BRAVE/ architecture

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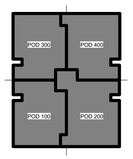

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SEAL:

Date Signed: 09.20.24

FILE:
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ISSUE:

LIGHTING COMCHECK

Scale: AS NOTED

E7.1

TEXAS ENGINEER FIRM REGISTRATION #F-15201

ASEIENGINEERING
350 Glenborough Dr. #270 Houston, TX 77067
www.aseiengineering.com o: 713-300-9579

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JOB NO: 240460
DFT: EV
DSN: EV
CHK: WSA

PLUMBING LEGEND

SYMBOL	ABBR.	DESCRIPTION
	W	WASTE OR SEWER PIPING
	CWV	COMBINATION WASTE AND VENT
GW	GW	GREASE WASTE
	V	VENT PIPING
	CW	COLD WATER PIPING
	HW	HOT WATER PIPING
	HWR	HOT WATER RETURN PIPING
G	G	NATURAL GAS PIPING
FW	FW	FILTERED WATER PIPING
RD	RD	ROOF DRAIN LEADER
RD	RD	ROOF OVERFLOW DRAIN LEADER
D	D/CD	INDIRECT OR CONDENSATE DRAIN
	-	ISOMETRIC CONTINUATION
	-	PIPE RISE
	-	PIPE DROP
	-	PIPE DROP UNDER A HORIZONTAL PIPE
	-	PIPE CAP
	-	PIPE BREAK
	GV	GATE VALVE
	GBV	GLOBE VALVE
	BV	BALL VALVE
	CV	CHECK VALVE
	PV	PLUG VALVE
S	SV	SOLENOID VALVE
	-	BALANCING VALVE
	BV	BUTTERFLY VALVE
	-	UNION
	-	REDUCER
	HB	HOSE BIBB
	GPR	GAS PRESSURE REGULATOR
F	F	FIRE SPRINKLER PIPING
	FS	FLOOR SINK
	FD	FLOOR DRAIN
	FCO/SCO	FLOOR OR SURFACE CLEAN OUT
	WCO	WALL CLEANOUT
	RD/OD	ROOF DRAIN / OVERFLOW DRAIN
	VTR	VENT THRU ROOF
	TP	TRAP PRIMER
	WHA	WATER HAMMER ARRESTOR
	PDP	POSITIVE DISPLACEMENT PUMP
	CP	CENTRIFUGAL PUMP
	POC	POINT OF CONNECTION BETWEEN NEW AND EXISTING

NOTE: ALL SYMBOLS MAY NOT APPLY

REFERENCE SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
# / SHEET	GENERAL REFERENCE DESIGNATES SHEET NUMBER	NAME / #	EQUIPMENT NAME AND NUMBER
# / SHEET	DETAIL REFERENCE TOP DESIGNATES DETAIL NUMBER BOTTOM DESIGNATES SHEET NUMBER	#	SHEET KEYNOTE NUMBER
		#	REVISION NUMBER
# / X0.0	SECTION REFERENCE TOP DESIGNATES SECTION NUMBER BOTTOM DESIGNATES SHEET NUMBER		ELEVATION SYMBOL
			NEW CONNECTION TO EXISTING

PLUMBING SPECIFICATIONS

NOTE: ALL SPECIFICATIONS MAY NOT APPLY

NOTICE TO OWNERS, ARCHITECTS AND CONTRACTORS REGARDING PRICING ESTIMATES
1. UNDER NO CIRCUMSTANCES SHALL THESE DRAWINGS BE "FINAL" OR "HARD BID" UNTIL THE PROJECT IS FULLY PERMITTED.
2. ALL PRELIMINARY PRICING EFFORTS SHALL BE CONSIDERED AS ESTIMATES ONLY AND SHALL INCLUDE SUCH CONTINGENCIES, ALLOWANCES, ALTERNATIVES, ETC. TO ACCOUNT FOR MODIFICATIONS AND ADDITIONS THAT WILL OCCUR TO THE DRAWINGS DURING FINALIZATION OF THE DESIGN AND PERMITTING PROCESS.

SCOPE OF WORK
1. ALL WORK REQUIRED CONSISTS OF PERFORMING ALL LABOR AND FURNISHING ALL MATERIALS, FIXTURES AND EQUIPMENT REQUIRED TO PROVIDE COMPLETE PLUMBING INSTALLATION AS INDICATED ON THE DRAWINGS. IT SHALL FURTHER INCLUDE FURNISHING AND INSTALLING ALL MISCELLANEOUS ITEMS REQUIRED FOR THE OPERATION OF THE SYSTEMS, WHETHER SPECIFICALLY CALLED FOR OR NOT. CONNECT ALL EQUIPMENT FURNISHED UNDER OTHER TRADES AS REQUIRED. DETERMINE IN ADVANCE THE SHUT-DOWN OF EXISTING UTILITIES.
2. EXACT LOCATION OF PLUMBING FIXTURES SHALL BE DETERMINED FROM ARCHITECTURAL DRAWINGS.
3. SPECIAL INSPECTIONS: WHERE THE PLANS INDICATE SPECIAL INSPECTIONS AND REPORT, OR AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION (AHJ), THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, HIRE AN INDEPENDENT THIRD PARTY INSPECTOR OR TESTING AGENCY TO PERFORM THE REQUIRED INSPECTIONS FOR THE TYPES OF WORK REQUIRED OR IDENTIFIED ON THE SPECIAL INSPECTION FORM. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL SIGNED REPORT TO THE REGISTERED DESIGN PROFESSIONAL ENGINEER, PROVIDING TEST RESULTS AND STATING WHETHER THE ITEMS REQUIRING SPECIAL INSPECTION WERE IN COMPLIANCE WITH THE INSPECTION REQUIREMENTS. PROVIDE ADDITIONAL COST FOR ENGINEER'S SEALED LETTER OF APPROVAL.

CODES
1. ALL MATERIALS, EQUIPMENT AND INSTALLATION MUST COMPLY WITH ALL APPLICABLE LAWS, CODES, RULES, AND REGULATIONS, REQUIRED BY CITY, COUNTY, STATE, AND FEDERAL AGENCIES.

PERMITS
1. THIS CONTRACTOR SHALL PAY FOR ALL PERMITS, LICENSES AND FEES REQUIRED BY STATE AND LOCAL AUTHORITIES.
2. COMBUSTIBLE MATERIALS SHALL NOT BE USED IN A NON-COMBUSTIBLE CONSTRUCTION TYPE BUILDING AS DEFINED BY THE BUILDING CODE. COMBUSTIBLE MATERIALS SHALL BE PROTECTED AS SPECIFIED BY THE ENGINEER AND ARCHITECT OF RECORD.

INSPECTION
1. FURNISH OWNER WITH CERTIFICATE OF INSPECTION AND APPROVAL BY LOCAL AUTHORITIES PRIOR TO FINAL ACCEPTANCE OF THE PROJECT BY THE OWNER. ALL WORK MUST BE INSPECTED.

EXISTING CONDITIONS
1. THE CONTRACTOR SHALL VERIFY EXACT LOCATIONS OF ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL VISIT THE SITE AND INSPECT THE WORK TO BE PERFORMED, IN ADDITION TO WHAT IS SHOWN HEREIN, AND INCLUDE IN BID AN AMOUNT TO DO SUCH WORK.
2. CONTRACTOR SHALL VERIFY INVERT ELEVATIONS OF SEWERS TO WHICH NEW WASTE LINES ARE TO BE CONNECTED BEFORE MAKING UP OR INSTALLATION OF NEW SYSTEM.
3. PRIOR TO COMMENCING WORK, PLUMBING CONTRACTOR SHALL CLEAN, TEST AND INSPECT ALL EXISTING ABOVE AND BELOW GROUND SEWER LINES TO INSURE THAT EXISTING SEWER PIPING IS IN SATISFACTORY WORKING CONDITION. CONTRACTOR SHALL REPORT ANY DEFECTS/DEFICIENCIES TO OWNER/ARCHITECT IMMEDIATELY. SUBMIT ADDENDUM BID TO ACCOMMODATE ANY REPAIR/REPLACEMENTS AS REQUIRED.
4. CONTRACTOR SHALL NOT CUT HOLES IN STRUCTURAL MEMBERS WITHOUT FIRST SECURING WRITTEN APPROVAL FROM THE ARCHITECT.

SHOP DRAWING SUBMITTALS
1. PRIOR TO PROCUREMENT, CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR REVIEW FOR ALL EQUIPMENT, INCLUDING THE FOLLOWING:
   A. DOMESTIC WATER, GAS, SANITARY AND STORM PIPING AND FITTINGS.
   B. BALL, BUTTERFLY VALVES, PRESSURE REDUCING VALVES AND SOLENOID VALVES.
   C. THERMAL INSULATION.
   D. WATER HEATERS AND PUMPS.
   E. OIL AND GREASE INTERCEPTORS.

MATERIALS
WATER PIPING:
1. ALL PIPING SHALL CONFORM TO THE REQUIREMENTS OF THE ANSI SAFETY CODE AND BE FREE FROM ALL DEFECTS AND BE PROPERLY IDENTIFIED.
2. ABOVE GROUND SHALL BE:
   2.1. TYPE "L" OR TYPE "M" HARD DRAWN COPPER TUBING CONFORMING TO ASTM B 88-72
   2.2. CPVC PLASTIC PIPE CONFORMING TO ASTM D 2846; ASTM F 441-442; CSA B137.6
   2.3. CROSS-LINKED POLYETHYLENE (PEX) PLASTIC TUBING, IF ALLOWED BY THE AUTHORITY HAVING JURISDICTION, CONFORMING TO ASTM F 876; ASTM F 877; CSA B137.5.
3. BELOW GROUND: (INSTALLED IN CONCRETE OR UNDER CONCRETE) TYPE "K" SOFT DRAWN COPPER TUBING, CONFORMING TO ASTM B 88-72, SPIRALLY WRAP PIPING BELOW GRADE OR FLOORS WITH 3 LAYERS OF 20 MIL POLYETHYLENE TAPE WITH 1/2 OVERLAP. INSTALL NO PIPING JOINTS BELOW FLOOR.
4. ALL COPPER TUBING SHALL UTILIZE SWEAT FITTINGS SOLDERED WITH ASTM B 32, ALLOY SN95, SN94, OR E, LEAD FREE SOLDER.

SOIL, WASTE, VENT AND STORM PIPING:
1. ALL SOIL AND WASTE PIPING SHALL SLOPE MINIMUM OF 1/4" PER FOOT. PIPING 4" AND LARGER MAY SLOPE 1/8" PER FOOT SLOPE IF SITE CONDITIONS WON'T ALLOW 1/4" PER FOOT SLOPE.
2. CHANGES IN DIRECTION, WHERE SPACE PERMITS, SHALL BE MADE WITH LONG SWEEP BENDS, Y-FITTINGS AND 1/8 OR 1/16 BENDS OR COMBINATION AND 1/8 BENDS.
3. SANITARY TEE BRANCHES AND 1/4 BENDS MAY BE USED FOR CONNECTION OF BRANCH LINES TO FIXTURES AND FROM STACKS TO HORIZONTAL DRAINAGE.
4. MATERIALS:
   4.1. CAST IRON: NO-HUB CAST IRON, CISPI DESIGNATION 301-12 FOR ALL SOIL, WASTE AND VENT PIPING WITH STANDARD WEIGHT FITTINGS. USE STAINLESS STEEL NO-HUB CAST IRON COUPLINGS THROUGHOUT THE PROJECT. INSTALL PIPE AND FITTINGS PER CISPI DESIGNATION 301-12. RESTRAIN PIPE AND FITTINGS USING ENGINEERED (HOLDRITE OR EQUAL) ASSEMBLIES INSTALLED PER MANUFACTURERS INSTRUCTIONS.
   4.2. GALVANIZED IRON: SCHEDULE 40 STANDARD WEIGHT CONFORMING TO ASTM A72-68. USE WROUGHT IRON SCREWED FITTINGS TO MATCH PIPE. MAKE ALL SCREWED JOINTS WITH TEFLON TAPE. (NO GALVANIZED IRON OR STEEL PIPE SHALL BE USED UNDERGROUND.)
   4.3. ABS: ABS PIPING CONFORMING TO ASTM D2661-78 FOR ALL SOIL, WASTE AND VENT PIPING WITH MATCHING FITTINGS. ABS ABOVE AND BELOW GRADE FOR COMBUSTIBLE CONSTRUCTION OR ALLOWED BY LOCAL JURISDICTION. ABS FOR NON-COMBUSTIBLE CONSTRUCTION BELOW GRADE ONLY.
   4.4. PVC: SCHEDULE 40 SOLID WALL PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM PVC COMPOUND WITH A CELL CLASS OF 12454 PER ASTM D 1784 AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE AND FITTINGS SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM D 1785 AND ASTM D 2665. ALL PIPE AND FITTINGS TO BE PRODUCED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND LOCAL CODE REQUIREMENTS. SOLVENT CEMENTS SHALL CONFORM TO ASTM D 2564. PRIMER SHALL CONFORM TO ASTM F 656. THE SYSTEM IS INTENDED FOR NON-PRESSURE DRAINAGE APPLICATIONS WHERE THE TEMPERATURE WILL NOT EXCEED 140° F.

VALVES:
1. SIZE OF SHUT-OFF VALVES, CONTROL VALVES, BALANCING COCKS, UNIONS ETC., SHALL BE FULL LINE SIZE.
2. PROVIDE SHUT-OFF VALVES IN CEILING SPACE FOR COLD AND HOT WATER PIPING CONNECTIONS TO ALL PLUMBING FIXTURES, HOSE BIBBS AND TRAP PRIMERS. PROVIDE STAINLESS STEEL CEILING/WALL ACCESS PANELS AS NECESSARY, IN ACCORDANCE WITH ARCHITECT'S REQUIREMENTS.

GAS PIPING:
1. THE PLUMBING CONTRACTOR SHALL SEE THAT THE PROPER GAS METER AND REGULATOR ARE INSTALLED BY THE UTILITY CO., AND PAY FOR ANY FEES CHARGED FOR THE INSTALLATION OF THE METER AND SERVICE LINES. GAS LINES SHALL EXTEND FROM THE METER TO ALL EQUIPMENT REQUIRING GAS.
2. MATERIALS:
   2.1. GAS PIPING ABOVE GROUND:
      A. SCREWED STANDARD WEIGHT SCHEDULE 40 BLACK STEEL CONFORMING TO ASTM A53 SPECIFICATIONS FOR GAS PIPING.
      B. 4" DIAMETER AND LARGER INTERIOR GAS PIPING SHALL BE WELDED.
   2.2. GAS PIPING INSTALLED BELOW GROUND:
      A. SCHEDULE 40 BLACK STEEL SHALL BE PROVIDED WITH FACTORY WRAPPED PROTECTIVE COATING WITH FITTINGS TRIPLE SPIRALLY WRAPPED WITH 20 MIL POLYETHYLENE TAPE WITH 1/2 OVERLAP. PROVIDE CATHODIC PROTECTION CONSISTING OF ONE 17 POUND MAGNESIUM ANODE PER 100 SQUARE FEET OF GROUND EXPOSED PIPE SURFACE.
      B. POLYETHYLENE PLASTIC PIPE, TUBING AND FITTINGS USED TO SUPPLY FUEL GAS SHALL CONFORM TO ASTM D 2513. SUCH PIPE SHALL BE MARKED "GAS" AND "ASTM D 2513."
3. GAS PIPE SHALL BE PROVIDED WITH SUITABLE DRIP LEGS ON ALL MAINS AND RISERS AT EQUIPMENT CONNECTIONS. ALL EQUIPMENT CONNECTIONS SHALL BE PROVIDED WITH AN AGA APPROVED SHUTOFF VALVE.
4. PROVIDE SLEEVES AT ALL PIPING PENETRATING MASONRY WALLS AND PACKED WATERTIGHT WITH APPROVED PACKING.
5. GAS PRESSURE REGULATORS. A LINE PRESSURE REGULATOR SHALL BE INSTALLED WHERE THE APPLIANCE IS DESIGNED TO OPERATE AT A LOWER PRESSURE THAN THE SUPPLY PRESSURE. LINE GAS PRESSURE REGULATORS SHALL BE LISTED AS COMPLYING WITH ANSI Z21.80. ACCESS SHALL BE PROVIDED TO PRESSURE REGULATORS. PRESSURE REGULATORS SHALL BE PROTECTED FROM PHYSICAL DAMAGE. REGULATORS INSTALLED ON THE EXTERIOR OF THE BUILDING SHALL BE APPROVED FOR OUTDOOR INSTALLATION.
6. MEDIUM PRESSURE (MP) REGULATORS SHALL COMPLY WITH ALL OF THE REQUIREMENTS OF THE LOCAL ADOPTED CODES.
7. VENTING OF REGULATORS. PRESSURE REGULATORS THAT REQUIRE A VENT SHALL BE VENTED DIRECTLY TO THE OUTDOORS. THE VENT SHALL BE DESIGNED TO PREVENT THE ENTRY OF INSECTS, WATER AND FOREIGN OBJECTS.
8. VENT PIPING. VENT PIPING FOR RELIEF VENTS AND BREATHER VENTS SHALL BE CONSTRUCTED OF MATERIALS ALLOWED FOR GAS PIPING AND INSTALLED IN ACCORDANCE WITH ALL LOCAL ADOPTED CODES. VENT PIPING SHALL BE NOT SMALLER THAN THE VENT CONNECTION ON THE PRESSURE REGULATING DEVICE.

COMPRESSED AIR PIPING
1. MATERIALS: COMPRESSED-AIR PIPING BETWEEN COMPRESSORS AND RECEIVERS, AND FOR DISTRIBUTION SHALL BE SCHEDULE 40 BLACK STEEL PIPE, COPPER TUBE, OR GALVANIZED STEEL PIPE. PVC OR CPVC IS NOT PERMITTED.
2. IDENTIFICATION: COMPRESSED-AIR PIPING SHALL BE PROVIDED WITH MARKINGS INCLUDING PIPING CONTENT'S NAME AND DIRECTION OF FLOW ARROW. MARKING SHALL BE PROVIDED AT EACH VALVE, AT WALL, FLOOR, OR CEILING PENETRATIONS, AT EACH CHANGE IN DIRECTION, AND AT A MINIMUM OF EVERY 20 FEET OR FRACTION THEREOF DURING THE PIPING RUN.
3. INSTALLATION:
   A. INSTALL AIR AND DRAIN PIPING WITH ONE PERCENT SLOPE DOWNWARD IN DIRECTION OF AIRFLOW.
   B. INSTALL ECCENTRIC REDUCERS WHERE PIPE IS REDUCED IN SIZE IN DIRECTION OF AIRFLOW, WITH BOTTOMS OF BOTH PIPES AND REDUCER FLUSH.
   C. CONNECT BRANCH AIR PIPING TO MAINS FROM TOP OF MAIN. PROVIDE DRAIN LEG AND DRAIN TRAP AT END OF EACH MAIN, BRANCH, AND LOW POINT IN PIPING.
4. SUPPORT: PIPING SHALL BE SUPPORTED IN SUCH A MANNER AS TO MAINTAIN ITS ALIGNMENT, AND PREVENT SAGGING. HANGERS AND ANCHORS SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT THE WEIGHT OF THE PIPE AND ITS CONTENTS. PIPING SHALL BE ISOLATED FROM INCOMPATIBLE MATERIALS. HANGER ROD SIZES FOR PIPE SIZES 1/2" THROUGH 4" SHALL BE NO SMALLER THAN 3/8". DO NOT EXCEED THE FOLLOWING SPACING BETWEEN PIPE HANGERS:
   STEEL PIPE- 12'-0" HORIZONTAL, 15'-0" VERTICAL
   COPPER TUBE- 1-1/4" AND SMALLER- 72" HORIZONTAL, 10'-0" VERTICAL
   1-1/2" AND LARGER- 10'-0" HORIZONTAL, 10'-0" VERTICAL
5. PIPING SYSTEM TESTS: TEST NEW AND MODIFIED PARTS OF EXISTING PIPING. CAP AND FILL COMPRESSED-AIR PIPING WITH OIL-FREE, DRY AIR, OR GASEOUS NITROGEN TO PRESSURE OF 50 PSIG ABOVE SYSTEM OPERATING PRESSURE, BUT NOT LESS THAN 150 PSIG. ISOLATE TEST SOURCE AND LET STAND FOR 4 HOURS TO EQUALIZE TEMPERATURE. REFILL SYSTEM, IF REQUIRED, TO TEST PRESSURE AND HOLD PRESSURE FOR 2 HOURS WITH NO DROP IN PRESSURE. REPAIR LEAKS AND DEFECTS WITH NEW MATERIALS AND RETEST SYSTEM UNTIL SATISFACTORY RESULTS ARE OBTAINED

PIPE HANGERS:
1. PIPE HANGERS SHALL BE MICHIGAN #400 FOR STEEL PIPING, #402 FOR GAS AND COPPER PIPING. SUPPORT PIPING 1-1/4" AND SMALLER 6'-0" O/C, AND PIPING 1-1/2" AND LARGER 10'-0" O/C. WASTE PIPING SHALL BE SUPPORTED AT 4'-0" O/C. PROVIDE 3/8" DIA. THREADED ROD PROPERLY BRACED FOR SEISMIC RESTRAINT ZONE 2.

PIPE INSULATION:
1. ALL DOMESTIC COLD WATER PIPING SHALL HAVE 1/2 INCH THICK FIBERGLASS INSULATION WHERE DAMAGE TO ANY BUILDING COMPONENTS WILL OCCUR AS A RESULT OF CONDENSATION FORMING ON COLD WATER PIPING.
2. ALL DOMESTIC HOT WATER AND HOT WATER RETURN PIPING SHALL HAVE 1 INCH THICK FIBERGLASS INSULATION.
3. PIPE INSULATION SHALL HAVE AN ASJ JACKET AND A THERMAL CONDUCTIVITY (K-FACTOR) NOT EXCEEDING 0.27 AT 75 DEGREES MEAN TEMPERATURE.
4. THE MAXIMUM FIRE HAZARD CLASSIFICATION OF THE INSULATION SYSTEM SHALL NOT HAVE MORE THAN A FLAME SPREAD OF 25, A FUEL CONTRIBUTED RATING OF 50, AND A SMOKE DEVELOPED RATING OF 50 WHEN TESTED IN ACCORDANCE WITH U.L. REQUIREMENTS. PIPE COVERING SHALL BEAR THE U.L. LABEL.
5. INSULATE ALL FITTINGS, VALVE BODIES ETC. WITH SINGLE OR MULTIPLE LAYERS OF INSULATION WITH PREFABRICATED FITTINGS WITH P.V.C. JACKETS.
6. SUBMIT SHOP DRAWINGS FOR ALL INSULATION MATERIALS.

CLEAN OUTS: (ZURN, JOSAM, SMITH)
1. CLEAN OUTS SHALL BE THE SAME SIZE AS THE LARGEST DOWNSTREAM PIPE IT IS SERVING. NO PLASTIC CLEAN OUTS WILL BE ACCEPTED. PLUGS SHALL BE BRONZE.

PIPE EXPANSION:
1. ALL PIPE CONNECTIONS SHALL BE INSTALLED TO ALLOW FOR FREEDOM OF MOVEMENT OF THE PIPING DURING EXPANSION AND CONTRACTION.
2. EXPANSION LOOPS AND EXPANSION JOINTS WITH PROPER ANCHORS AND GUIDES SHALL BE PROVIDED AS REQUIRED. ANCHORS AND JOINTS SHALL BE SUBJECT TO THE REVIEW OF THE ARCHITECT.
3. ALL SUPPORTS SHALL BE INSTALLED TO PERMIT THE MATERIALS TO CONTRACT AND EXPAND FREELY WITHOUT PUTTING A STRAIN OR STRESS ON ANY PART OF THE SYSTEM. PROVIDE ANCHORS AS REQUIRED.

UNIONS
1. PROVIDE A UNION BETWEEN CONNECTIONS TO EACH FIXTURE, DEVICE OR PIECE OF EQUIPMENT FOR DISCONNECTING OF PIPING.
2. CONTRACTOR SHALL INSTALL DIELECTRIC UNIONS AT CONNECTIONS OF DISSIMILAR METALS.

PIPE INSTALLATION
1. INSTALL PIPING TO BEST SUIT FIELD CONDITIONS, COORDINATE LAYOUT OF PIPING WITH DUCT WORK AND OFFSET PIPING AS REQUIRED TO CLEAR NEW WORK.
2. ALL VENTS THROUGH ROOF SHALL BE MINIMUM 10'-0" REMOVED FROM ALL AIR INTAKES, EVAPORATIVE COOLERS, ETC.
3. CONTRACTOR SHALL ROUGH-IN ALL WASTE AND SUPPLY PIPING TO SPECIAL EQUIPMENT ACCORDING TO MANUFACTURERS SHOP DRAWINGS AND MAKE FINAL CONNECTIONS. ALL SUPPLIES SHALL BE VALVED.
4. A WATER-HAMMER ARRESTOR SHALL BE INSTALLED WHERE QUICK-CLOSING VALVES ARE UTILIZED. INCLUDES TOILET FLUSH VALVE GROUPS AND CONNECTIONS TO ALL SOLENOID ACTIVATED VALVES. WATER-HAMMER ARRESTORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND SHALL CONFORM TO ASSE 1010.
5. PROVIDE MEANS OF PREVENTING DISSIMILAR METAL CONTACT BETWEEN ALL PIPING MATERIALS FROM ANY OTHER METAL OR STRUCTURAL MEMBER TO PREVENT GALVANIC ACTION BETWEEN THE TWO METALS.
6. WHEN WATER PIPE AND SEWER ARE LAID PARALLEL TO EACH OTHER, ONE OF THE FOLLOWING PROCEDURES MUST BE FOLLOWED:
   A. THE HORIZONTAL DISTANCE BETWEEN THE WATER PIPE AND SEWER SHALL NOT BE LESS THAN SIX (6) FEET.
   B. EACH LINE SHALL BE LAID IN A SEPARATE TRENCH, OR IN BETWEEN FILLED WITH COMPACT FILL.
   C. THE WATER SERVICE PIPE MAY BE PLACED IN THE TRENCH WITH THE BUILDING DRAIN AND/OR BUILDING SEWER, PROVIDED THE BOTTOM OF THE WATER SERVICE PIPE, AT ALL POINTS SHALL BE AT LEAST TWELVE (12) INCHES ABOVE THE TOP OF THE SEWER LINE, AND SHALL BE PLACED ON A SOLID SHELF EXCAVATED AT ONE SIDE OF THE COMMON TRENCH.
   D. WATER SERVICE AND SEWER SHALL BE CONSTRUCTED OF MATERIALS APPROVED FOR USE WITHIN A BUILDING AND PRESSURE TESTED TO ASSURE WATER TIGHTNESS BEFORE BACKFILLING

ACCESSIBILITY
1. THE INSTALLATION OF ALL VALVES, UNIONS, THERMOMETERS, GAUGES, OR OTHER INDICATING OR RECORDING DEVICES, OR SPECIALITIES REQUIRING FREQUENT READING, REPAIRS, ADJUSTMENT, INSPECTION, REMOVAL, OR REPLACEMENT SHALL BE CONVENIENTLY AND ACCESSIBLY LOCATED WITH REFERENCE TO THE FINISHED BUILDING.

TESTING
1. FILL DOMESTIC WATER SYSTEM WITH WATER AND PRESSURIZE TO 125 PSI AND MAINTAIN FOR (4) FOUR HOURS WITH NO PRESSURE DROP.
2. FILL WASTE, SOIL, VENT AND STORM DRAINAGE SYSTEMS WITH WATER TO HIGHEST POINT OF THE SYSTEM. HOLD PRESSURE FOR (4) HOURS WITH NO DROP IN WATER LEVEL.
3. IF THE SYSTEM IS TESTED IN SECTIONS, EACH SECTION SHALL BE FILLED WITH WATER BUT NO SECTION SHALL BE TESTED WITH LESS THAN A TEN FOOT HEAD OF WATER.
4. GAS TESTING:
   A. AIR PRESSURE TEST SYSTEM TO 75 PSI AND MAINTAIN FOR A PERIOD OF (8) HOURS WITH NO PRESSURE DROP.
   B. PURGE LINE WITH NITROGEN AT JUNCTION WITH MAIN LINE AT GAS METER TO REMOVE ALL AIR. CLEAR COMPLETE LINE BY ATTACHING A TEST PILOT FIXTURE AT CAPPED STUB-IN LINE AT THE BUILDING LOCATION, AND LET GAS FLOW UNTIL TEST PILOT IGNITES. CAUTION: FAILURE TO PURGE SYSTEM MAY RESULT IN EXPLOSION WITHIN LINE WHEN AIR-TO-GAS IS AT CORRECT MIXTURE.
5. TEST AND OBTAIN APPROVAL ON ALL UNDERGROUND PIPING BEFORE COVERING WORK. PROVIDE WRITTEN TESTING REPORT TO ARCHITECT.

CLEANING
1. AT THE COMPLETION OF THE WORK AND PRIOR TO FINAL ACCEPTANCE, ALL PARTS OF THE WORK INSTALLED UNDER THIS SPECIFICATION SHALL BE THOROUGHLY CLEANED. ALL EQUIPMENT, FIXTURES, PIPE, VALVES AND FITTINGS SHALL BE CLEANED OF GREASE, METAL CUTTINGS AND SLUDGE WHICH MAY HAVE ACCUMULATED BY OPERATION OF THE SYSTEM FOR TESTING HEREIN BEFORE SPECIFIED OR FROM OTHER CAUSES.

STERILIZATION
1. STERILIZE THE ENTIRE WATER DISTRIBUTION SYSTEM THOROUGHLY WITH A SOLUTION CONTAINING NOT LESS THAN 50 PARTS PER MILLION OF AVAILABLE CHLORINE. FOR CHLORINATING MATERIALS USE SODIUM HYPOCHLORITE SOLUTION CONFORMING TO FEDERAL SPEC. 0-8-441, GRADE D, AND INTRODUCE INTO THE SYSTEM BY USE OF A COCK AT A SLOW, EVEN, CONTINUOUS RATE. ALLOW THE STERILIZING SOLUTION TO REMAIN IN THE SYSTEM FOR A PERIOD OF 24 HOURS, DURING WHICH TIME ALL VALVES AND FAUCETS SHALL BE OPENED AND CLOSED SEVERAL TIMES. AFTER STERILIZATION, FLUSH THE SOLUTION FROM THE SYSTEM WITH CLEAN WATER UNTIL THE RESIDUAL CHLORINE CONTENT IS NO GREATER THAN 0.2 PARTS PER MILLION. PLATE COUNT SHALL INDICATE COUNT LESS THAN 100 BACTERIA PER CC.

GUARANTEE
1. THE CONTRACTOR SHALL GUARANTEE ALL MATERIALS, EQUIPMENT, AND WORKMANSHIP FROM DEFECT OF MATERIAL AND WORKMANSHIP, AND SHALL REPLACE OR REPAIR, WITHOUT ADDITIONAL COST TO THE OWNER, ALL DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD (1) YEAR AFTER COMPLETION AND ACCEPTANCE.

COORDINATION
1. ALL CONTRACTORS SHALL BE RESPONSIBLE FOR COORDINATING WORK WITH OTHER TRADES AFFECTED BY EACH OTHERS WORK AND FOR CUTTING AND REFINISHING OF EXISTING WALLS, FLOORS, SOLID AND SUSPENDED CEILINGS ETC., WHERE REQUIRED BY WORK SHOWN AND NOTED HEREIN. INSTALL ALL WORK TO CLEAR NEW AND EXISTING ARCHITECTURAL AND STRUCTURAL MEMBERS. ITEMS SUCH AS PIPE, FITTINGS, ETC., SHALL NOT BE INSTALLED IN CONFLICT WITH EQUIPMENT. COORDINATE ALL CUTTING AND PATCHING WITH THE GENERAL CONTRACTOR. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING OF HIS WORK. OBTAIN WRITTEN PERMISSION OF ARCHITECT BEFORE PROCEEDING WITH ANY CUTTING OR PATCHING OF STRUCTURAL SYSTEMS.

SUBSTITUTIONS
1. SUBSTITUTIONS OF MATERIALS OR PRODUCTS SHOWN HEREIN SHALL BE AT THE OWNER'S, ARCHITECT'S OR ENGINEER'S WRITTEN APPROVAL ONLY, WITH COPIES OF APPROVAL SENT TO ARCHITECT FOR PROJECT FILE. DEVIATION FROM THESE DRAWINGS WILL NOT BE ALLOWED. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ALL SUBSTITUTIONS AND ALL COSTS OF CHANGES INCURRED BY THEMSELVES AND OTHERS DUE TO THE SUBSTITUTIONS.

RECORD DRAWINGS
1. PROVIDE TWO (2) SETS OF "RECORD" DRAWINGS (AS-BUILTS) AND TWO (2) BOUND SETS OF ALL OPERATIONS MANUALS, DIAGRAMS, SERVICE CONTRACTS, GUARANTEES, ETC., ONE FOR THE OWNER AND ONE FOR BUILDING OPERATIONS DEPARTMENT. OBTAIN A COMPLETE SET OF RECORD DRAWINGS OF EXISTING CONSTRUCTION FROM THE OWNERS FOR INFORMATION ON EXISTING CONDITIONS. INCORPORATE ANY EXISTING CONDITIONS ON NEW RECORD DRAWINGS REQUIRED TO SHOW THE "INSTALLED" INSTALLATION.

ORDER OF PRECEDENCE OF DOCUMENTS
1. SHOULD A CONFLICT ARISE BETWEEN CONSTRUCTION DOCUMENTS, THE ORDER OF PRECEDENCE SHALL BE:
   A. SPECIAL PROVISIONS
   B. GENERAL PROVISIONS
   C. SPECIFICATIONS
   D. DETAILS ON DRAWINGS
   E. PLAN DRAWINGS
2. THE ENGINEER OF RECORD SHALL BE NOTIFIED BEFORE A DECISION IS MADE.

2021 IECC COMPLIANCE NOTES

1. WATER-HEATING EQUIPMENT NOT SUPPLIED WITH INTEGRAL HEAT TRAPS AND SERVING NON-CIRCULATING SYSTEMS SHALL BE PROVIDED WITH HEAT TRAPS ON SUPPLY AND DISCHARGE PIPING ASSOCIATED WITH EQUIPMENT.
2. PROVIDE MINIMUM 1" PIPE INSULATION HAVING A CONDUCTIVITY NOT GREATER THAN 0.27 BTU PER IN/HR FT2/ DEG °F ON AUTOMATIC-CIRCULATING HOT WATER SYSTEMS. PROVIDE MINIMUM 1/2" INSULATION HAVING A CONDUCTIVITY NOT GREATER THAN 0.27 BTU PER IN./HR FT2/ DEG °F FOR FIRST 8 FEET OF NON-CIRCULATING SYSTEMS WITHOUT INTEGRAL HEAT TRAPS.
3. SERVICE WATER-HEATING EQUIPMENT SHALL BE PROVIDED WITH CONTROLS TO ALLOW A SET POINT OF 110 DEG F FOR EQUIPMENT SERVING DWELLING UNITS AND 90 DEG F FOR EQUIPMENT SERVING OTHER OCCUPANCIES. THE OUTLET TEMPERATURE OF LAVATORIES IN PUBLIC FACILITY RESTROOMS SHALL NOT EXCEED 110 DEG F.
4. WATER-HEATING EQUIPMENT AND HOT WATER STORAGE TANKS SHALL MEET THE REQUIREMENTS OF THE CURRENT IECC CODE. THE EFFICIENCY SHALL BE VERIFIED THROUGH DATA FURNISHED BY THE MANUFACTURER OR THROUGH CERTIFICATION UNDER AN APPROVED CERTIFICATION PROGRAM.

CODE INFORMATION

1. 2021 IBC, 2021 UPC, 2021 IECC & CITY OF BEAUMONT AMENDMENTS. ALL SYSTEMS SHALL BE IN COMPLIANCE WITH THE ABOVE CODES AS ADOPTED BY THE CITY OF BEAUMONT.
2. EQUIPMENT AND APPLIANCES SHALL BE INSTALLED AS REQUIRED BY THE TERMS OF THEIR APPROVAL, IN ACCORDANCE WITH THE CONDITIONS OF THE LISTING, THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THIS CODE. MANUFACTURER'S INSTALLATION INSTRUCTIONS SHALL BE AVAILABLE ON THE JOB SITE AT THE TIME OF INSPECTION PER THE PLUMBING CODE.
3. MATERIALS EXPOSED WITHIN PLENUMS SHALL HAVE A FLAME SPREAD RATING INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE TO ASTM E84.
4. ALL MATERIAL INSTALLED WITHIN PLENUMS SHALL BE APPROVED FOR THAT LOCATION AND PLENUM RATED. TYPICAL PER IMC. 602.

P - PLUMBING SHEET LIST

SHEET NUMBER	SHEET NAME
P0.1	PLUMBING ABBREVIATIONS AND SYMBOLS
P1.1	PLUMBING PLAN - WASTE
P1.2	PLUMBING PLAN - WATER
P2.1	PLUMBING SCHEMATICS
P3.1	PLUMBING SCHEDULES AND CALCULATIONS

TEXAS ENGINEER FIRM REGISTRATION #F-15201

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JOB NO: 240460
DFT: MJ / IF
DSN:MJ / IF
CHK:DEM

JC DIVERSION CENTER RENOVATION

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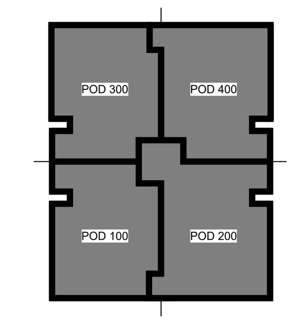
KEYPLAN:



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SEAL:

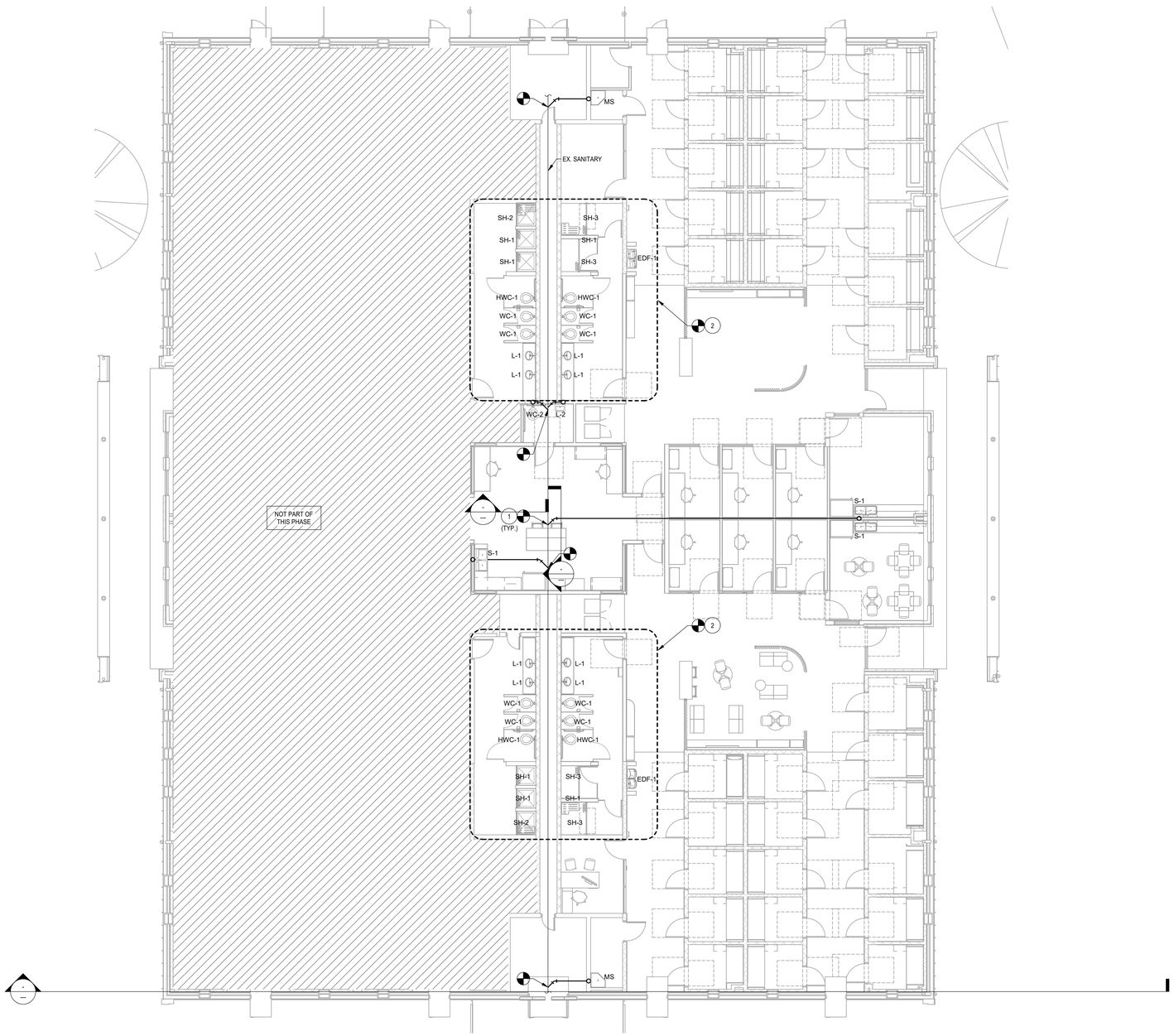
Date Signed: 09/24/24

FILE:
DRAWN BY: -
CHECKED BY: -
ISSUE:

PLUMBING ABBREVIATIONS AND SYMBOLS

Scale: AS NOTED

P0.1



1 PLUMBING PLAN - WASTE
SCALE: 1/8" = 1'-0"

GENERAL NOTES (WASTE)

A. CONTRACTOR SHALL FIELD VERIFY SEWER UTILITY CONNECTION SIZE, LOCATION, SLOPE, DIRECTION OF FLOW AND INVERT PRIOR TO BEGINNING CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES BETWEEN PLANS AND ACTUAL FIELD CONDITIONS
B. UNDERGROUND NON-METALLIC SANITARY DRAINAGE PIPING LARGER THAN 2 INCHES IN DIAMETER SHALL BE INSTALLED WITH INSULATED COPPER TRACER WIRE OR OTHER APPROVED CONDUCTOR LOCATED ADJACENT TO THE PIPING. THE TRACER WIRE SHALL TERMINATE ABOVE THE GROUND AT EACH END OF THE NON-METALLIC PIPING. THE TRACER WIRE SIZE SHALL BE NOT LESS THAN 18 AWG AND THE INSULATION TYPE SHALL BE SUITABLE FOR DIRECT BURIAL.
C. ALL PIPE, PIPE FITTINGS, TRAPS, FIXTURES, MATERIAL AND DEVICES USED IN THIS PLUMBING SYSTEM SHALL BE LISTED OR LABELED BY A LISTING AGENCY. EACH LENGTH OF PIPE AND EACH PIPE FITTING, TRAPS, FIXTURE, MATERIAL AND DEVICES USED IN THIS PLUMBING SYSTEM SHALL HAVE CAST, STAMPED, OR INDELIBLY MARKED ON IT THE MAKERS MARK OR NAME, SUCH MARKING IS REQUIRED BY THE APPROVED STANDARD THAT APPLIES
D. ALL FLOOR CLEAN OUTS, FLOOR SINKS, AND FLOOR DRAINS TO SET FLUSH WITH FINISHED FLOOR
E. ALL FLOOR DRAINS AND FLOOR SINKS SHALL HAVE TRAP PRIMERS PROVIDED OR AS DIRECTED BY THE LOCAL JURISDICTION.
F. ALL INDIRECT WASTE PIPING INSTALLED WITH A LENGTH GREATER THAN 5'-0" SHALL HAVE A CLEANOUT PROVIDED. MAXIMUM LENGTH OF INDIRECT WASTE LINE SHALL BE 15'-0". FOR EACH REQUIRED EQUIPMENT INDIRECT WASTE PIPING CONNECTION, ROUTE INDIRECT WASTE PIPING FROM EQUIPMENT TO NEAREST FLOOR SINK. INDIRECT WASTE PIPING SHALL BE COPPER TYPE "DWV" WITH SOLDERED END DRAINAGE FITTINGS.
G. ALL INDIRECT WASTE PIPING THAT EXCEEDS 30 INCHES IN DEVELOPED LENGTH MEASURED HORIZONTALLY, OR 54 INCHES IN TOTAL DEVELOPED LENGTH SHALL BE TRAPPED.
H. ALL INDIRECT WASTES, CONDENSATE AND RELIEF VALVE DRAINS SHALL HAVE CODE APPROVED AIR GAPS.
J. EACH VENT SHALL TERMINATE NOT LESS THAN 10 FT FROM OR 3 FT ABOVE ANY WINDOW, DOOR OPENING, AIR INTAKE OR VENT SHAFT, NOR LESS THAN 3 FT IN EVERY DIRECTION FROM ANY LOT LINE (ALLEY & STREET ACCEPTED).
K. PROVIDE CHROME PLATED P-TRAP, TAILPIECE AND ESCUTCHEON AT EACH HAND SINK/LAVATORY WITH A DIRECT WASTE CONNECTION.
L. ALL FLOOR SINKS SHALL HAVE HALF GRATE UNLESS NOTED OTHERWISE. FLOOR SINKS LOCATED BELOW EQUIPMENT SHALL BE A MINIMUM 50% EXPOSED AND SHALL BE INSTALLED FLUSH WITH FINISHED FLOOR OR AS DIRECTED BY LOCAL JURISDICTION.

GENERAL NOTES (WATER & GAS)

A. CONTRACTOR SHALL FIELD VERIFY EXISTING WATER UTILITY CONNECTION SIZE AND LOCATION PRIOR TO BEGINNING CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES BETWEEN THE PLANS AND ACTUAL FIELD CONDITIONS.
B. PLUMBING CONTRACTOR TO COORDINATE EXACT STREET WATER PRESSURE AND NOTIFY ENGINEER OF ANY DISCREPANCIES. CONTRACTOR SHALL PROVIDE A PRESSURE REDUCING VALVE (PRV) IF STREET WATER PRESSURE EXCEDS 80 PSI. PRV SHALL BE INSTALLED ON BUILDING SIDE OF WATER METER AND SET TO 80 PSI.
C. CONTRACTOR TO FIELD VERIFY EXISTING DOMESTIC WATER SYSTEM IS PROVIDED WITH A REDUCED PRESSURE BACKFLOW PREVENTER (RPBP). IF NOT EXISTING, PROVIDE AN APPROVED RPBP ASSEMBLY SIZED TO MATCH BUILDING WATER METER. INSTALL NEW RPBP BETWEEN THE WATER METER AND THE BUILDING PER LOCAL JURISDICTION'S REQUIREMENTS.
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E. MAKE SHUTOFF VALVES ACCESSIBLE NEAR THE EQUIPMENT THEY SERVE.
F. ALL HAND SINKS/LAVATORIES SHALL BE PROVIDED WITH A THERMO-STATIC MIXING VALVE TO SUPPLY TEMPERED HW, MAX. 110 DEG. F.
G. PROVIDE CHROME PLATED STOP VALVES AT EACH REQUIRED EQUIPMENT WATER CONNECTION. PROVIDE AGA COMPLIANT BALL VALVE AT EACH REQUIRED EQUIPMENT GAS CONNECTION.
H. ALL POTABLE WATER OUTLETS WITH HOSE ATTACHMENTS AND HOSE BIBBS SHALL BE PROTECTED FROM CROSS CONNECTION W/ APPROVED BACKFLOW PREVENTION DEVICES.
J. MINIMUM DEPTH OF GAS PIPING TO BE 24" BELOW GRADE. COORDINATE WITH LOCAL GAS COMPANY.
K. GAS PIPING SHALL NOT BE INSTALLED IN OR ON THE GROUND UNDER ANY BUILDING.
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M. PROVIDE SHUT-OFF COCK, UNION, AND 6" LONG DIRT LEG WITH CAP AT EACH GAS LINE DROP TO APPLIANCE.
N. DO NOT USE FLEXIBLE PIPE CONNECTIONS TO EQUIPMENT.
P. ALL GAS PIPING UNDER ASPHALT OR CONCRETE PAVING ADJOINING BUILDING MUST BE SLEEVED IN GAS TIGHT VENTED PIPE IN ACCORDANCE WITH LOCAL GAS CODE.
Q. ALL GAS PIPING MATERIALS, VALVES, FITTINGS, INSTALLATION AND TESTING SHALL COMPLY WITH LOCALLY ACCEPTED PLUMBING CODE AND GAS COMPANY REGULATIONS.
R. VERIFY ALL GAS BTU/H INPUTS WITH ACTUAL BTU/H INPUT OF APPLIANCE SUPPLIED.
S. A BUILDING SHUT OFF VALVE SHALL BE INSTALLED ON MAIN GAS LINE AT GAS METER.

KEYED NOTES

1 CONNECT NEW WASTE LINE TO EXISTING 4" WASTE LINE BELOW FLOOR AT THIS LOCATION. FIELD VERIFY EXACT SIZE, LOCATION, SLOPE, DIRECTION OF FLOW AND INVERT PRIOR TO INSTALLATION.
2 EXISTING PLUMBING FIXTURES TO BE REPLACED AT SAME LOCATION. RE-CONNECT PLUMBING LINES. FIELD VERIFY EXACT LOCATION.

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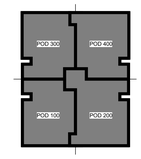

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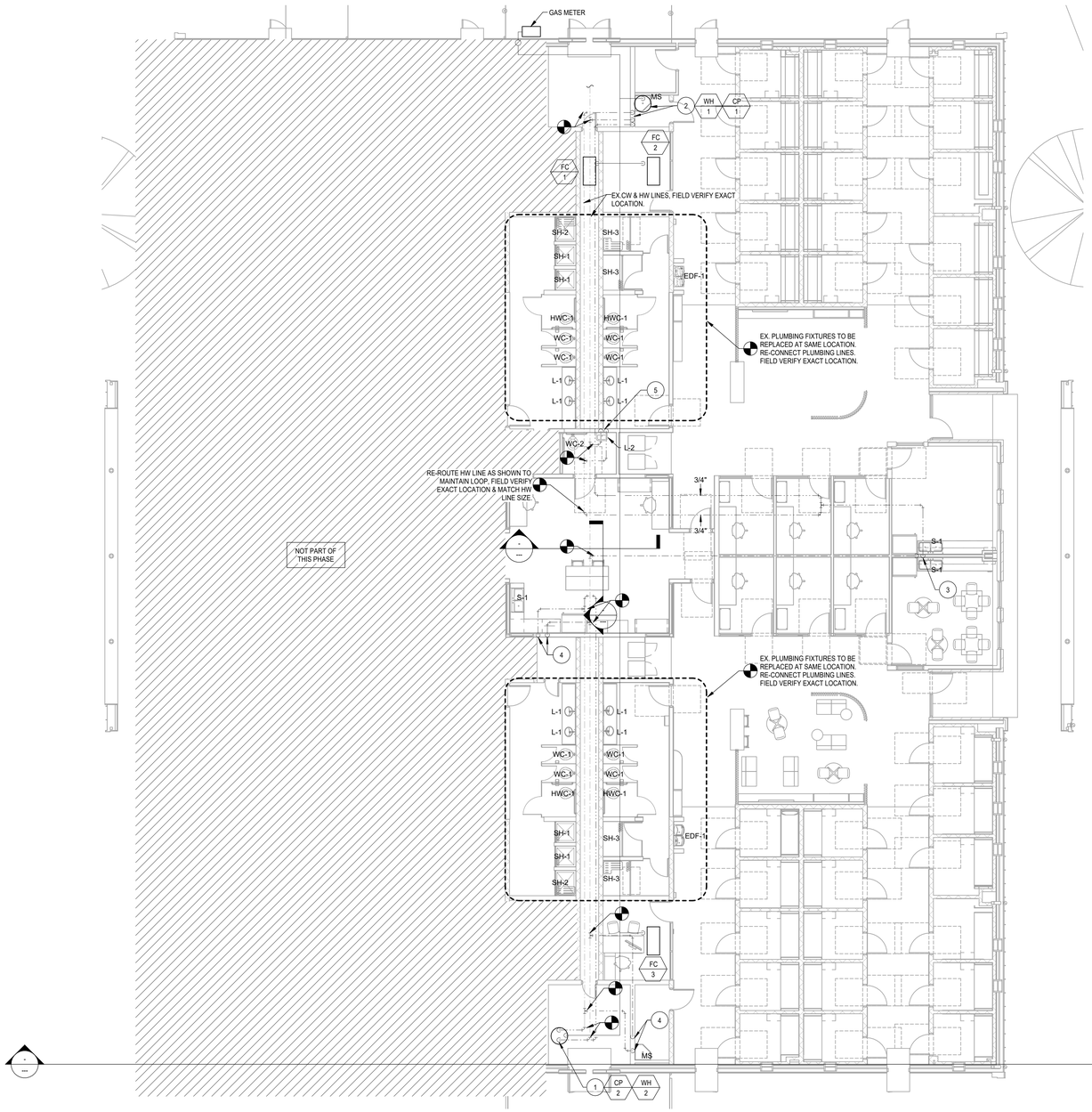
PLUMBING PLAN - WASTE

Scale: AS NOTED

P1.1



1 PLUMBING PLAN - WATER
SCALE: 1/8" = 1'-0"

GENERAL NOTES (WASTE)

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S. A BUILDING SHUT OFF VALVE SHALL BE INSTALLED ON MAIN GAS LINE AT GAS METER.

KEYED NOTES

1 ROUTE 1-1/2" CW/HW LINES DOWN TO/FROM WATER HEATER AND 3/4" HWR LINE TO RE-CIRCULATION PUMP AND CONNECT TO CW LINE.
2 ROUTE 1-1/2" CW/HW LINES DOWN TO/FROM WATER HEATER AND 3/4" HWR LINE TO RE-CIRCULATION PUMP AND CONNECT TO CW LINE. ROUTE 3/4" CW/HW LINES TO MS.
3 ROUTE 3/4" CW/HW LINES DOWN WALL TO HEADER. ROUTE 3/4" CW/HW LINES TO EACH S-1.
4 ROUTE 3/4" CW/HW LINES DOWN WALL TO S-1 / MS.
5 ROUTE 1-1/2" CW (TO HEADER) & 3/4" HW LINES DOWN WALL. ROUTE 3/4" CW/HW LINES TO L-2, ROUTE 1-1/2" CW LINE TO WC-2.

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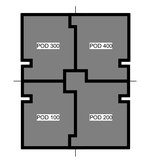

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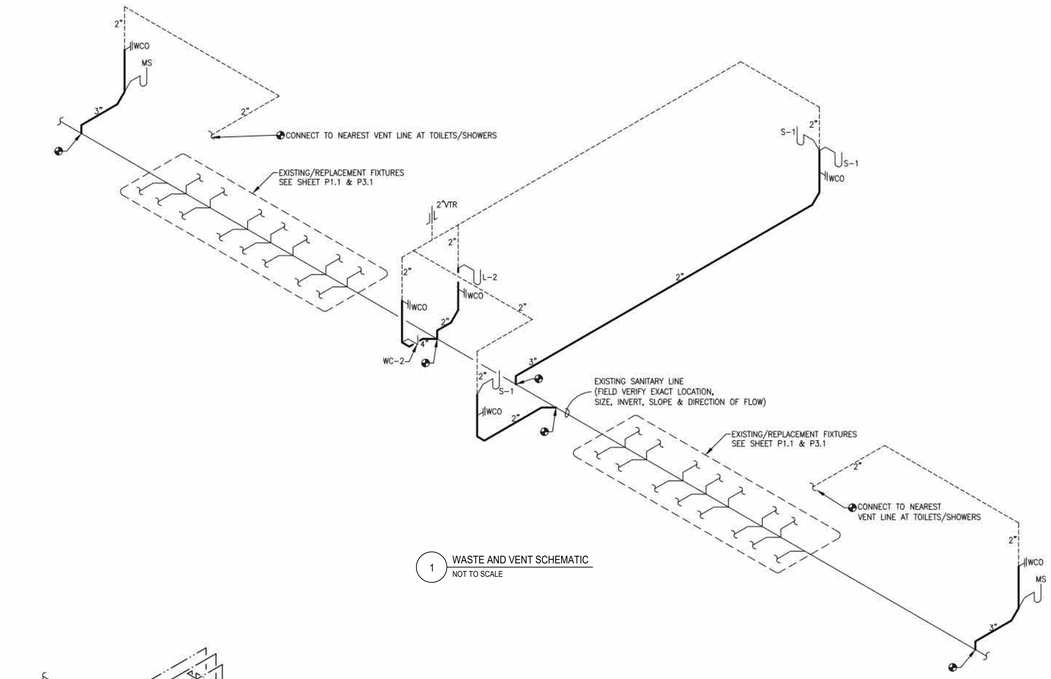
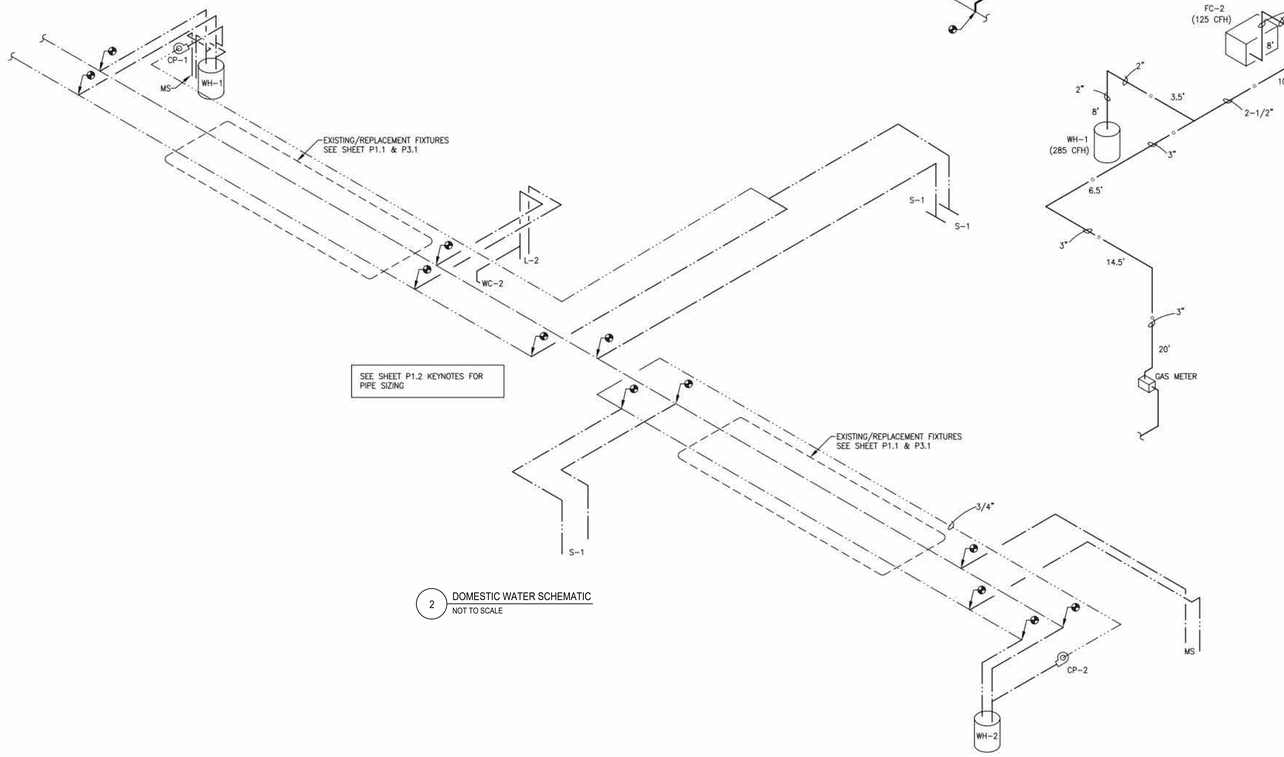
PLUMBING PLAN - WATER

Scale: AS NOTED

P1.2



1 WASTE AND VENT SCHEMATIC
NOT TO SCALE



2 DOMESTIC WATER SCHEMATIC
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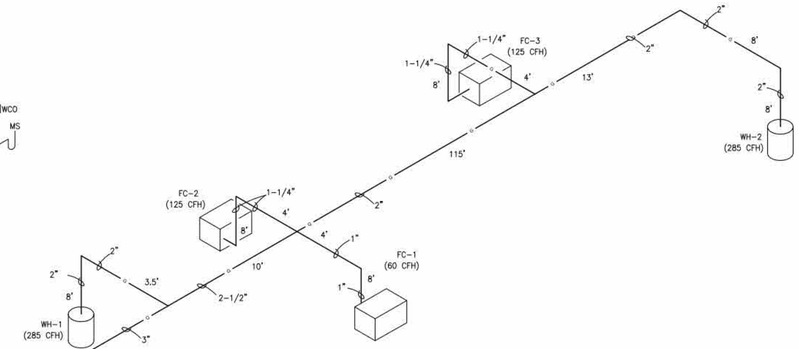

NATURAL GAS CALCULATION

NATURAL GAS CALCULATION – LESS THAN 2 PSI:
SIZED PER IFGC TABLE 402.4(1).

TOTAL LENGTH: 194'
25% FOR FITTINGS: 49'
TOTAL DEVELOPED LENGTH: 243'

TOTAL LOAD: 880 CFH

NOTE:
CONTRACTOR TO COORDINATE WITH LOCAL UTILITY COMPANY AND PROVIDE A MINIMUM PRESSURE OF 6" W.C. AT METER. PROVIDE LOW-PRESSURE REGULATOR AT METER IF REQUIRED.

3 NATURAL GAS SCHEMATIC
NOT TO SCALE

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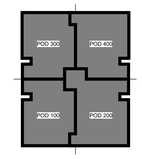

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PLUMBING SCHEMATICS

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WATER HEATER SCHEDULE (WH -)

MARK	MANUFACTURER	MODEL	TYPE	SERVICE	STOR. CAP.	INPUT	ELECTRICAL			TEMP. RISE	RECOVERY G.P.H.	EFF.	REMARKS
							VOLTS	PHASE	HZ				
1, 2	LOCHINVAR	SWR285N	TANK	DOMESTIC	110 GAL	NAT. GAS 285 MBH	120	1	60	100°	328	.95	DIRECT-VENT APPLIANCE W/ FACTORY 4" CONCENTRIC VENT TERM. KIT. WEIGHT W/ WATER: 1703

PUMP SCHEDULE (CP -)

MARK	MANUFACTURER	MODEL	G.P.M.	FT.HD.	H.P.	RPM	VOLTS/PH.	REMARKS
1, 2	ARMSTRONG	ASTRO-30	4	12'	1/25	1750	115/1	HW RECIRCULATION - BRONZE BODY PUMP, 3/4" SIZE. PROVIDE TIMER CONTROL W/ AQUASTAT FOR PUMP SHUT DOWN.

P - PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	FIXTURE MANUF.	FIXTURE MODEL	FAUCET MANUF.	FAUCET MODEL	DESCRIPTION	SERVICE PIPE SIZES				WASTE FIXTURE UNITS	WATER FIXTURE UNITS
							DRAIN	VENT	CW	HW		
EDF-1	ELECTRIC DRINKING FOUNTAIN	ELKAY	LZSTL8LC			GREY ADA, 115V, 60 Hz, BI-LEVEL PUSH-BAR, FLEXI-GAURD BUBBLER	2"	2"	1/2"		1	0.25
HWC-1	WATER CLOSET	AMERICAN STANDARD	AFWALL			1.28 GPF, MANUAL FLUSH VALVE MODEL#: 6047.121.002, CHURCH ELONGATED WHITE, OPEN-FRONT, SOLID SEAT. INSTALL AT HEIGHT PER ARCHITECT.	4"	2"	1-1/2"		6	10
L-1	UNDERMOUNT LAVATORY	KOHLER	K-2209-0	DELTA	87T105	PROVIDE w/ TMV BELOW COUNTER, PROVIDE 0.5 GPM AERATOR	2"	2"	3/4"	3/4"	1	2
L-2	UNDERMOUNT LAVATORY	KOHLER	K-2209-0	DELTA	87T105	PROVIDE w/ TMV BELOW COUNTER, PROVIDE 0.5 GPM AERATOR	2"	2"	3/4"	3/4"	1	2
MS	MOP SINK	FIAT	MSBID2424	CHICAGO	897-RCF	PROVIDE w/ PAIL HOOK, VACUUM BREAKER, & 3/4" HOSE THREAD.	2"	2"	3/4"	3/4"	2	3
S-1	EMPLOYEE LOUNGE SINK	ELKAY	CR43223	MAINLINE	XD2758-CP	43x22x6-7/8" DEEP TWO COMP SINK, 1.5 GPM MAX.	2"	2"	3/4"	3/4"	2	2
SH-1	SHOWER	BY	OTHERS			POWERS #F727 PRESSURE EQUALIZING SHOWER VALVE w/ LCD TEMP. DISPLAY, CHECK STOPS & ADJ BRASS HEAD w/ 2.5 GPM FLOW CONTROL. JR SMITH 2005 DUCT CAST IRON BODY.	2"	2"	3/4"	3/4"	4	4
SH-2	ADA SHOWER	BY	OTHERS			POWERS #F727 PRESSURE EQUALIZING SHOWER VALVE w/ LCD TEMP. DISPLAY, CHECK STOPS & ADJ BRASS HEAD w/ 2.5 GPM FLOW CONTROL. JR SMITH 2005 DUCT CAST IRON BODY.	2"	2"	3/4"	3/4"	4	4
SH-3	ADA SHOWER	BY	OTHERS			POWERS #F727 PRESSURE EQUALIZING SHOWER VALVE w/ LCD TEMP. DISPLAY, CHECK STOPS & ADJ BRASS HEAD w/ 2.5 GPM FLOW CONTROL. JR SMITH 2005 DUCT CAST IRON BODY.	2"	2"	3/4"	3/4"	4	4
WC-1	WATER CLOSET	AMERICAN STANDARD	AFWALL			1.28 GPF, MANUAL FLUSH VALVE MODEL#: 6047.121.002, CHURCH ELONGATED WHITE, OPEN-FRONT, SOLID SEAT. INSTALL AT HEIGHT PER ARCHITECT.	4"	2"	1-1/2"		6	10
WC-2	WATER CLOSET	AMERICAN STANDARD	AFWALL			1.28 GPF, MANUAL FLUSH VALVE MODEL#: 6047.121.002, CHURCH ELONGATED WHITE, OPEN-FRONT, SOLID SEAT. INSTALL AT HEIGHT PER ARCHITECT.	4"	2"	1-1/2"		6	10

DOMESTIC WATER CALCULATIONS

EXISTING / REPLACEMENT FIXTURES:

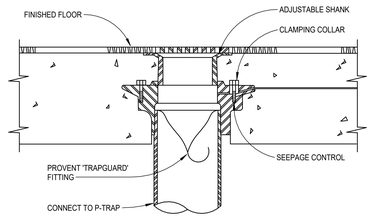
2 - MS		3.0	FU =	6.0
8 - SH-1	(PUBLIC)	4.0	FU =	32.0
4 - SH-2	(PUBLIC)	4.0	FU =	16.0
4 - HWC-1	(PUBLIC)	10.0	FU =	40.0
8 - WC-1	(PUBLIC)	10.0	FU =	80.0
4 - EDF-1		1.0	FU =	1.0
8 - L-1		2.0	FU =	16.0
TOTAL (EXISTING/REPLACEMENT):			191.0	FU (FLUSH VALVE)

NEW FIXTURES ON THIS T.I.:

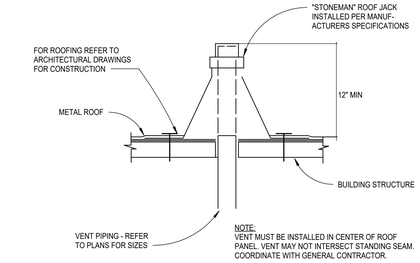
3 - S-1		1.4	FU =	4.2
1 - L-2	(PRIVATE)	0.7	FU =	0.7
1 - WC-2	(PRIVATE)	6.0	FU =	6.0
2 - MS		3.0	FU =	6.0
TOTAL THIS T.I.:			16.9	FU
TOTAL:			207.9	FU = 92 GPM (FLUSH VALVE)

NOTE:
THE FIXTURES BEING SHOWN AS NEW FOR THIS PERMIT ARE UTILIZING 16.9 FU OF THE EXISTING WATER METER'S FUTURE FIXTURE UNITS AVAILABLE.
PIPE SIZES ARE CONSERVITIVLY SIZED USING 4 PSI/100'.

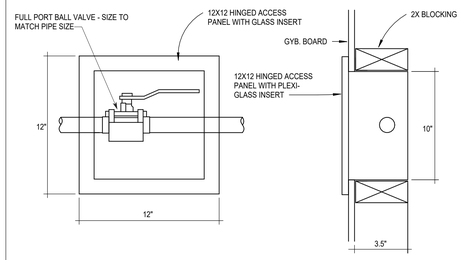
SIZE	GPM	FIXTURE UNITS - FLUSH TANK	FIXTURE UNITS - FLUSH VALVE
1/2"	2	1	-
3/4"	5	6	-
1"	12	16	-
1-1/4"	21	31	-
1-1/2"	32	58	15
2"	70	225	106
2-1/2"	116	460	336
3"	200	945	931



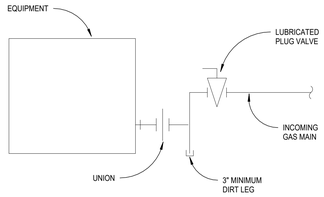
4 TRAPGUARD DETAIL
SCALE: NONE



3 VENT THRU ROOF
SCALE: NONE



2 VALVE BOX
SCALE: NONE



1 GAS CONNECTION DETAIL
SCALE: NONE

TEXAS ENGINEER FIRM REGISTRATION #F-15201

ASEIENGINEERING
350 Glenborough Dr. #270 Houston, TX 77067
www.aseiengineering.com o: 713-300-9579

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JOB NO: 240460
DFT: MJ / IF
DSN: MJ / IF
CHK: DEM

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE / architecture
4200 Montrose Blvd., Suite 400
Houston, Texas 77006
713.524.5858 v / 713.524.5868 f
studio@bravearchitecture.com

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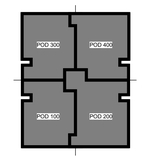
Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
Landscape Contact

STRUCTURAL
DALLY + ASSOCIATES
9800 RICHMOND AVE, SUITE 460
HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

KEYPLAN:



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SEAL:

Date Signed: 10/01/24

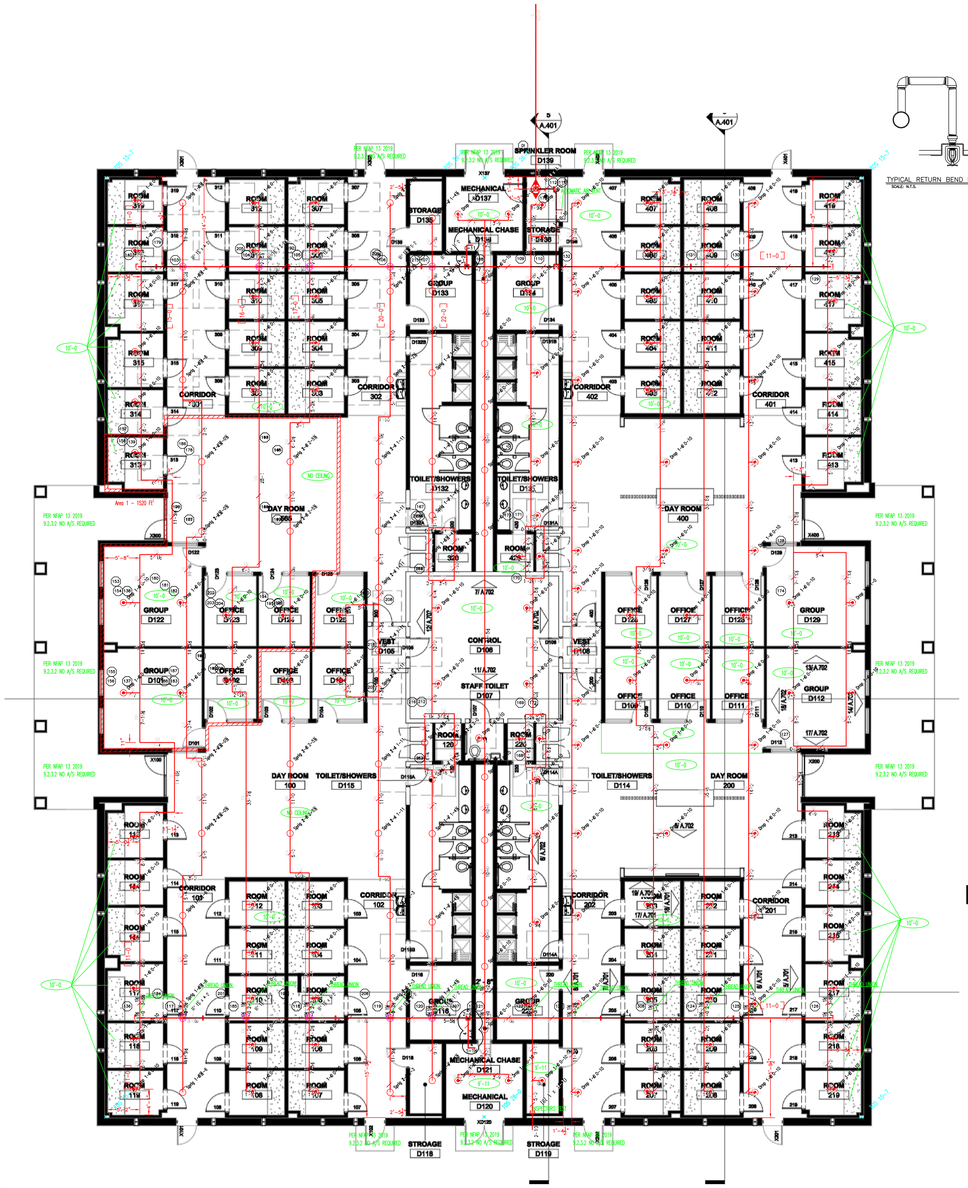
FILE: -
DRAWN BY: -
CHECKED BY: -

ISSUE:

PLUMBING SCHEDULES AND CALCULATIONS

Scale: AS NOTED

P3.1



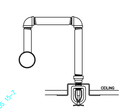
FIRE SPRINKLER PLAN

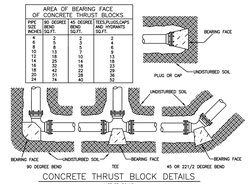
Scale: 1/8" = 1'0

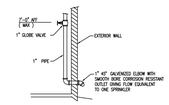
GRAPHIC SCALE

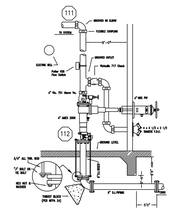
8' 4' 0' 8' 16'

1/8" = 1'-0"









GENERAL NOTES

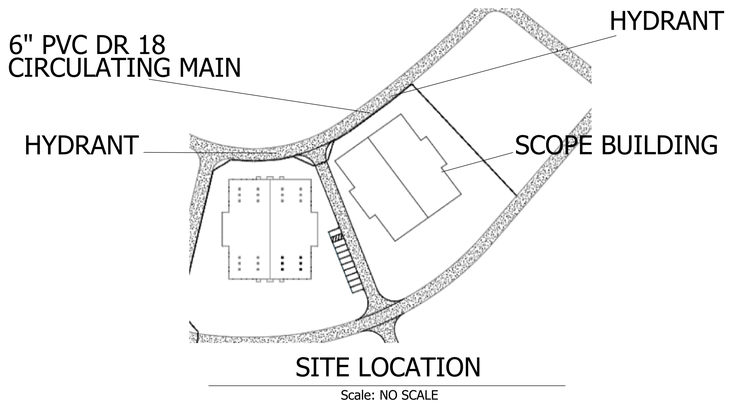
1. ALL DIMENSIONS SHOWN ARE CENTER TO CENTER (U.N.O.)
2. ALL PIPE TO BE IN ACCORDANCE WITH N.F.P.A. 13, 2019 AND FM DATASHEETS
3. ALL ELECTRICAL CONNECTIONS TO BE PROVIDED BY OTHERS.
4. ALL OUTLETS ON 2-1/2" AND LARGER MAINS TO BE SHOP WELDED IN ACCORDANCE WITH N.F.P.A. 13, 2019, USING BONNEY FORGE ULFM WELD FITTINGS.
5. ALL GROOVED FITTINGS TO BE FIRELOCK WITH FIRELOCK COUPLINGS #009N
6. ALL SCREWED FITTINGS TO BE BLACK CAST IRON CLASS#125
7. ALL PIPE 2" AND SMALLER TO BE DOMESTIC BLACK SCH. 40 ASTM-A135.
8. ALL PIPE 2-1/2" AND LARGER TO BE DOMESTIC BLACK SCH. 10 ASTM-A135
9. 2-1/2" AND LARGER PIPE TO BE GROOVED U.N.O.
10. THROUGH WALL PIPE TO BE GALVANIZED
11. SYSTEM TO BE HYDRAULICALLY CALCULATED PER N.F.P.A. 13, 2019 AND APPLICABLE FM DATASHEETS
12. A CAP IS PROVIDED AT THE END OF CROSS MAINS FOR FLUSHING.
13. ALL PIPE PENETRATIONS THROUGH FIRE RATED WALLS TO BE SLEEVED AND FILLED WITH FIRE RETARDANT.
14. HEADS TO BE IN CENTER OF TILE. (U.N.O)
15. SUFFICIENT HEATING SHALL BE SUPPLIED TO MAINTAIN SYSTEM TEMPERATURE TO AT LEAST 40 F

CEILING NOTE:

CEILINGS MUST FORM A CONTINUOUS MEMBRANE FROM WALL TO WALL BETWEEN THE FLOOR ABOVE, AND THE OCCUPIED SPACE BELOW WITHOUT OPENINGS OTHER THAN THOSE NORMALLY PROVIDED FOR HVAC. OPENINGS OTHER THAN THOSE DEEMED NECESSARY FOR HVAC WILL REQUIRE THAT SPRINKLER PROTECTION BE PROVIDED ABOVE THE CEILING.

SCOPE NOTE

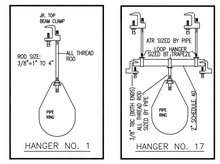
FIRE SPRINKLER CONTRACTOR WORK TO BEGIN AT THE CITY MAIN. THE WORK SHALL CONSIST OF INSTALLING A NEW WET FIRE SPRINKLER SYSTEM THROUGHOUT THE EXISTING BUILDING.



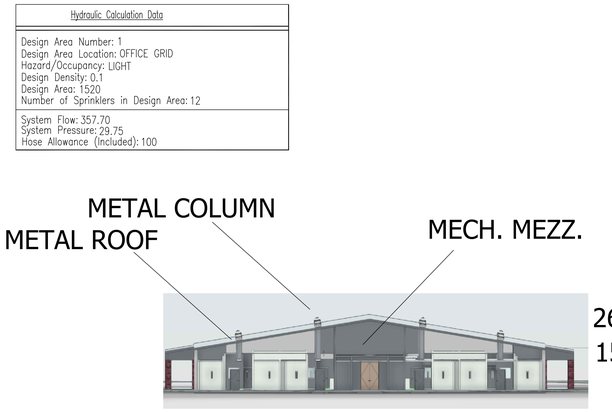
SITE LOCATION

Scale: NO SCALE

WATER FLOW TEST	
STATIC (P.S.I.)	50
RESIDUAL (P.S.I.)	26
FLOW (G.P.M.)	822
Date: 4/18/24	

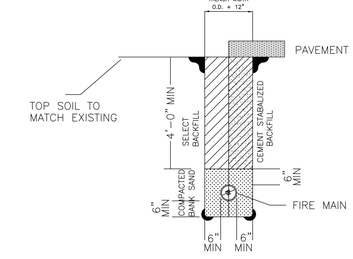


Hydraulic Calculation Data
Design Area Number: 1 Design Area Location: OFFICE GRID Hazard/Occupancy: LIGHT Design Density: 0.1 Design Area: 1520 Number of Sprinklers in Design Area: 12
System Flow: 357.70 System Pressure: 29.75 Hose Allowance (Included): 100



CROSS SECTION

Scale: NO SCALE



N.T.S.

FIRE/WATER MAIN BEDDING AND BACKFILL

HYDRAULIC SYSTEM

This building is protected by a Hydraulically Designed Automatic Sprinkler System.

Location	OFFICES
No. of Sprinklers	12
Basis of Design	
1. DENSITY	0.1 GPM/SQ.FT.
2. DESIGNED AREA OF DISCHARGE	1520 SQ.FT.
System Demand	
1. GPM DISCHARGE	357.7 GPM
2. RESIDUAL PRESSURE AT THE BASE OF THE RISER	31.74 PSI

Hydraulic data placard information

I have reviewed these plans and certify that they comply with the adopted NFPA Standards.

KOETTER FIRE PROTECTION OF HOUSTON, LLC
15390 VANTAGE PARKWAY W.
HOUSTON, TX 77032
713-733-6888
SCR - G -0780

RME-Signature:_____
Printed RME Name: BRIAN MARTIN
RME-G-3061387 Date:_____
☐ AS-BUILT ☒ SUBMITTAL ☐ OTHER

General Notes
1. All Pipe Locations are to be Field Measured Prior to Fabrication and Installation by Sprinkler Contractor. 2. All Dimensions Shown are Center to Center. 3. High Temperature Heads are to be Field Located Where Required. 4. All Pipes and Hangers are to be Installed per NFPA #13. 5. Hangers are to be U.L. Listed and F.M. Approved.

Symbols	
Symbol	Description
○	Hydraulic Reference Points
[-= mj]	Elev. Below Top of Steel
[+=]	Elev. Above Finished Floor
+ (105 20-0)	Elev. of Top of Steel
<55>	Ceiling Height
—/—	Denotes Hanger Location
o	Rise up or down

Number of Sprinklers		
Total This Sheet: 186	Total This Job: 202	
Symbol	Description	
◉	QTY:135 VIC.V5606 FL-QR CHROME 1/2" K5.6 155F PD	
○	QTY:51 VICTAULIC V2704 1/2" K5.6 155F UP BRASS	

Drawing Title	FIRE SPRINKLER DRAWING		
Contract No.	2024110	Revisions:	Date:
Drawn By	SJB	MECHANICAL MEZZANINE	9/20/24
Scale	1/8"=1'0		
Date	4/28/24		
Approval By	BM		

Job:
JEFFERSON COUNTY DIVERSION CENTER
3890 FM3514
BEAUMONT, TX 77705

Contractor:
KOETTER FIRE PROTECTION OF HOUSTON
15390 VANTAGE PARKWAY W
HOUSTON, TEXAS 77032

SHEET 1 OF 2

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE/ architecture
4200 Montrose Blvd., Suite 400
Houston, Texas 77006
713.524.5858 v / 713.524.5868 f
studio@bravearchitecture.com

CIVIL
DALLY + ASSOCIATES
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HOUSTON, TEXAS 77042
Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
Landscape Contact

STRUCTURAL
DALLY + ASSOCIATES
9800 RICHMOND AVE, SUITE 460
HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
PRICE CONSULTING, INC
211 HIGHLAND CROSS DRIVE SUITE
200 HOUSTON, TX 77073
Consultant Contact

AV/IT CONSULTANT
DATACOM DESIGN GROUP
9111 JOLLYVILLE ROAD, SUITE 290
AUSTIN, TX 78759
Consultant Contact

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SEAL:

DOCUMENT IS HEREBY INCLUDED AS REFERENCE ONLY

09/23/2024

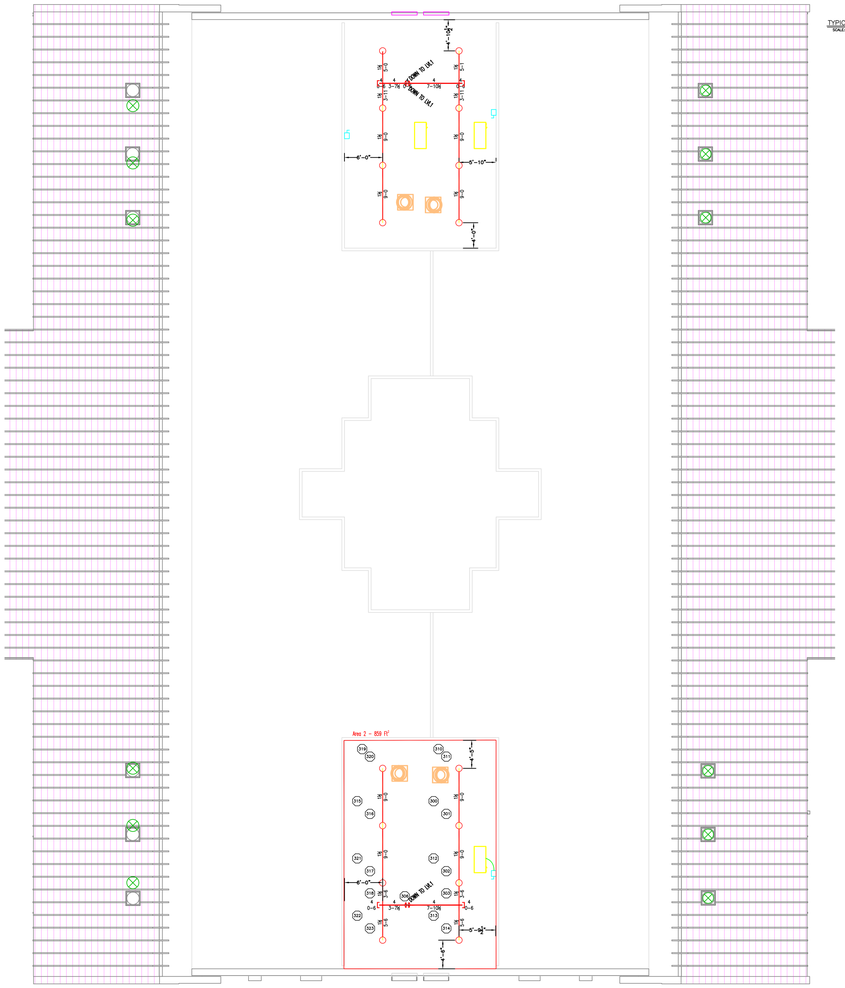
FILE:
DRAWN BY: Author
CHECKED BY: Checker

ISSUE:
09/23/2024 100% CONSTRUCTION DOCUMENTS

FIRE SPRINKLER PLAN - LEVEL 1

Scale: AS NOTED

FS.01_



FIRE SPRINKLER PLAN LVL2

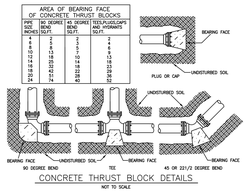
Scale: 1/8" = 1'0

GRAPHIC SCALE

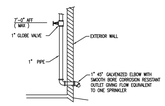
8' 4' 0' 8' 16'

1/8" = 1'-0"

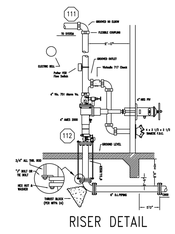
TYPICAL RETURN BEND DETAIL
SCALE: N.T.S.



CONCRETE THRUST BLOCK DETAILS
NOT TO SCALE



INSPECTORS TEST
NOT TO SCALE



RISER DETAIL

GENERAL NOTES

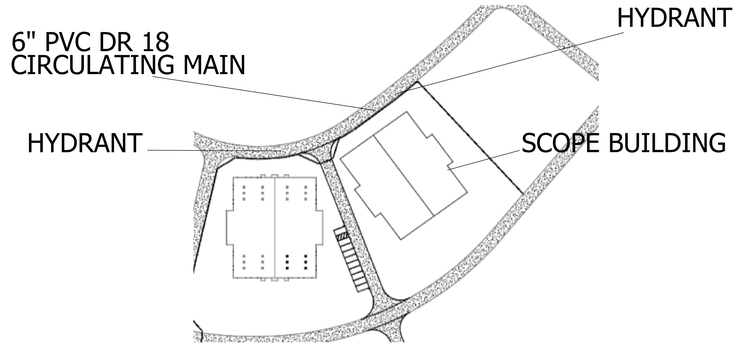
1. ALL DIMENSIONS SHOWN ARE CENTER TO CENTER (U.N.O.)
2. ALL PIPE TO BE IN ACCORDANCE WITH N.F.P.A. 13, 2019 AND FM DATASHEETS
3. ALL ELECTRICAL CONNECTIONS TO BE PROVIDED BY OTHERS.
4. ALL OUTLETS ON 2-1/2" AND LARGER MAINS TO BE SHOP WELDED IN ACCORDANCE WITH N.F.P.A. 13, 2019, USING BONNEY FORGE ULFW WELD FITTINGS.
5. ALL GROOVED FITTINGS TO BE FIRELOCK WITH FIRELOCK COUPLINGS #009N
6. ALL SCREWED FITTINGS TO BE BLACK CAST IRON CLASS#125
7. ALL PIPE 2" AND SMALLER TO BE DOMESTIC BLACK SCH. 40 ASTM-A135.
8. ALL PIPE 2-1/2" AND LARGER TO BE DOMESTIC BLACK SCH. 10 ASTM-A135
9. 2-1/2" AND LARGER PIPE TO BE GROOVED U.N.O.
10. THROUGH WALL PIPE TO BE GALVANIZED
11. SYSTEM TO BE HYDRAULICALLY CALCULATED PER N.F.P.A. 13, 2019 AND APPLICABLE FM DATASHEETS
12. A CAP IS PROVIDED AT THE END OF CROSS MAINS FOR FLUSHING.
13. ALL PIPE PENETRATIONS THROUGH FIRE RATED WALLS TO BE SLEEVED AND FILLED WITH FIRE RETARDANT.
14. HEADS TO BE IN CENTER OF TILE. (U.N.O).
15. SUFFICIENT HEATING SHALL BE SUPPLIED TO MAINTAIN SYSTEM TEMPERATURE TO AT LEAST 40 F

CEILING NOTE:

CEILINGS MUST FORM A CONTINUOUS MEMBRANE FROM WALL TO WALL BETWEEN THE FLOOR ABOVE, AND THE OCCUPIED SPACE BELOW WITHOUT OPENINGS OTHER THAN THOSE NORMALLY PROVIDED FOR HVAC. OPENINGS OTHER THAN THOSE DEEMED NECESSARY FOR HVAC WILL REQUIRE THAT SPRINKLER PROTECTION BE PROVIDED ABOVE THE CEILING.

SCOPE NOTE

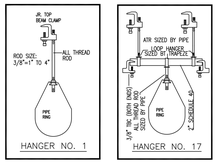
FIRE SPRINKLER CONTRACTOR WORK TO BEGIN AT THE CITY MAIN. THE WORK SHALL CONSIST OF INSTALLING A NEW WET FIRE SPRINKLER SYSTEM THROUGHOUT THE EXISTING BUILDING.



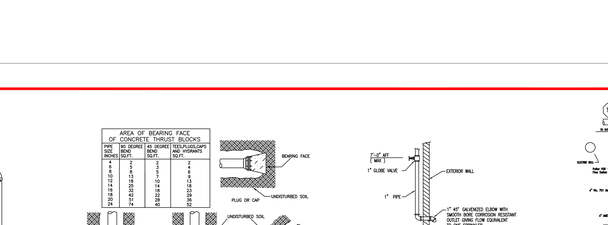
SITE LOCATION

Scale: NO SCALE

WATER FLOW TEST	
STATIC (P.S.I.)	50
RESIDUAL (P.S.I.)	26
FLOW (G.P.M.)	822
Date: 4/18/24	

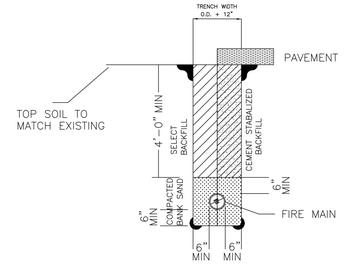


Hydraulic Calculation Data
Design Area Number: 2 Design Area Location: Mech. Mezz Hazard/Occupancy: OH 1 Design Density: 0.15 Design Area: 859 Number of Sprinklers in Design Area: 8
System Flow: 414.61 System Pressure: 25.30 Hose Allowance (Included): 250



CROSS SECTION

Scale: NO SCALE



N.T.S.

FIRE/WATER MAIN BEDDING AND BACKFILL

HYDRAULIC SYSTEM

This building is protected by a Hydraulically Designed Automatic Sprinkler System.

Location	OFFICES
No. of Sprinklers	12
Basis of Design	
1. DENSITY	0.1 GPM/SQ.FT.
2. DESIGNED AREA OF DISCHARGE	1520 SQ.FT.
System Demand	
1. GPM DISCHARGE	357.7 GPM
2. RESIDUAL PRESSURE AT THE BASE OF THE RISER	31.74 PSI

Hydraulic data placard information

I have reviewed these plans and certify that they comply with the adopted NFPA Standards.

KOETTER FIRE PROTECTION OF HOUSTON, LLC
15390 VANTAGE PARKWAY W.
HOUSTON, TX 77032
713-733-0888
SCR - G -0780

RME-Signature:
Printed RME Name: BRIAN MARTIN
RME-G-3061387 Date:
☐ AS-BUILT ☒ SUBMITTAL ☐ OTHER

General Notes

1. All Pipe Locations are to be Field Measured Prior to Fabrication and Installation by Sprinkler Contractor.
2. All Dimensions Shown are Center to Center.
3. High Temperature Heads are to be Field Located Where Required.
4. All Pipes and Hangers are to be Installed per NFPA #13.
5. Hangers are to be U.L. Listed and F.M. Approved.

Symbols

Symbol	Description
○	Hydraulic Reference Points
[+ #s]	Elev. Below Top of Steel
[+-+]	Elev. Above Finished Floor
+ (105 20-0)	Elev. of Top of Steel
⟨⟩	Ceiling Height
⌒	Denotes Hanger Location
o	Rise up or down

Number of Sprinklers

Total This Sheet: 16 Total This Job: 202

Symbol	Description
◯	QTY:16 VICTAULIC V2704 1/2" K5.6 155°F UP BRASS

Drawing Title	FIRE SPRINKLER DRAWING	Revisions:	Date:
Contract No.	2024110	MECHANICAL MEZZANINE	9/20/24
Drawn By	SJB		
Scale	1/8"=1'0		
Date	4/28/24		
Approval By	BM		

Job: JEFFERSON COUNTY DIVERSION CENTER
3890 FM3514
BEAUMONT, TX 77705

Contractor: KOETTER FIRE PROTECTION OF HOUSTON
15390 VANTAGE PARKWAY W
HOUSTON, TEXAS 77032

SHEET 2 OF 2

JC DIVERSION CENTER RENOVATION

3890 FM3514, BEAUMONT, TX 77705

B/A Project No.: 23141

BRAVE/ architecture
4200 Montrose Blvd., Suite 400
Houston, Texas 77006
713.524.5858 v / 713.524.5868 f
studio@bravearchitecture.com

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DALLY + ASSOCIATES
9800 RICHMOND AVE SUITE 460
HOUSTON, TEXAS 77042
Civil Contact

LANDSCAPE
KW LANDSCAPE ARCHITECTS
6925 PORTWEST DRIVE, SUITE 100
HOUSTON, TX 77024
Landscape Contact

STRUCTURAL
DALLY + ASSOCIATES
9800 RICHMOND AVE, SUITE 460
HOUSTON, TEXAS 77042
Structural Contact

MEP
ASEI ENGINEERING
350 GLENBOROUGH DR, SUITE 270
HOUSTON, TX 77067
MEP Contact

BUILDING ENVELOPE
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09/23/2024

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DRAWN BY: Author
CHECKED BY: Checker

ISSUE:
09/23/2024 100% CONSTRUCTION DOCUMENTS

FIRE SPRINKLER PLAN - MEZZANINE

Scale: AS NOTED

FS.02_

BACKBONE CABLING NOTES

FIBER OPTIC BACKBONE CABLE:

1.) AT&T TO DETERMINE WHERE THE INCOMING FIBER OPTIC CABLE WILL TERMINATE.

2.) PROVIDE FOR A FIBER OPTIC CABLE FROM AT&T TERMINATION POINT TO THE CABINET LOCATION IN THE CONTROL ROOM. CABLE TYPE SHALL MATCH AT&T.

COPPER BACKBONE CABLE:

1.) EXTEND A NEW 50-PAIR PLENUM COPPER CABLE TO CABINET IN CONTROL ROOM.

2.) TERMINATE ON A NEW CABINET MOUNTED 48-PORT PATCH PANEL, ASSUME 1-PAIR PER PORT.

3.) TERMINATE NEW AND INTEGRATE WITH EXISTING ON WALL MOUNTED TERMINATION HARDWARE. COORDINATE UTILIZING 110 OR 66-STYLE TERMINATION BLOCKS.

GENERAL NOTES

GENERAL CONTRACTOR/CONSTRUCTION MANAGER NOTES:

1.) GENERAL CONTRACTOR/CONSTRUCTION MANAGER IS RESPONSIBLE TO ENSURE THAT ALL DIVISIONS AND TRADES ARE AWARE OF WORK REQUIRED TO SUPPORT THE INSTALLATION OF RELATED SYSTEMS AND SUB-SYSTEMS. CONTRACTORS ARE RESPONSIBLE TO REVIEW ALL RELATED SPECIFICATIONS AND DRAWINGS.

2.) PROVIDE AND INSTALL WALL MOUNTED ¾" AC GRADE PLYWOOD ON WALL NEAR COMMUNICATIONS CABINET. DO NOT ATTACH PLYWOOD TO WALL WITH DRYWALL SCREWS.

3.) APPLY PAINT TO PLYWOOD FRONT AND EDGES.

4.) J-HOOK PATHWAYS, SLEEVES, BOXES, POWER, AND CONDUITS SHOWN ON COMMUNICATIONS DRAWINGS ARE FOR COORDINATION ONLY. REFER TO ELECTRICAL DRAWINGS AND SPECIFICATIONS.

ELECTRICAL CONTRACTOR NOTES:

1.) THE ELECTRICAL CONTRACTOR SHALL FURNISH AND PROVIDE THE FOLLOWING FOR COMMUNICATIONS CABLING: CABLE TRAY, CONDUIT, SLEEVES, WALL, AND FLOOR BOXES REFER TO THE ELECTRICAL AND COMMUNICATIONS DETAIL DRAWINGS. SOME WALL BOXES WILL BE SURFACE MOUNT, APPLY SAME INSTALLATION METHODOLOGIES TO TELECOM BOXES AS ELECTRICAL BOXES.

A.) STANDARD DATA AND VOICE SERVICE BOXES FOR COMMUNICATIONS SHALL BE A FLUSH 4 11/16" SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE AND A 1"Ø CONDUIT FROM BOX TO ACCESSIBLE CEILING SPACE.

B.) WALL MOUNTED TELEPHONE OUTLET SHALL BE A FLUSH 4 11/16" SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE AND A 1"Ø CONDUIT FROM BOX TO ACCESSIBLE CEILING SPACE. MOUNT BOX 48" AFF OR AS REQUIRED BY ADA.

C.) FLOOR BOXES FOR DATA, VOICE, AND POWER SHALL HAVE TWO(2) 1"Ø CONDUITS PROVIDED FOR COMMUNICATIONS IN ADDITION TO POWER AND AV REQUIREMENTS.

D.) CEILING BOXES FOR COMMUNICATIONS OUTLETS SHALL BE A 4 11/16" SQ DEEP BOX (2⅛" MIN) WITH A SINGLE GANG REDUCTION PLATE, AND A 1"Ø CONDUIT FROM EACH BOX TO ACCESSIBLE CEILING SPACE.

E.) BOXES FOR WIRELESS DEVICES MOUNTED ABOVE LAY-IN CEILINGS SHALL BE A 4 11/16"SQ DEEP BOX (2⅛" MIN) WITH SINGLE GANG REDUCTION PLATE (TYP).

2.) CONTRACTOR SHALL PROVIDE RACEWAY INSTALLATION IN A MANNER THAT WILL PROTECT ALL DATA/VOICE/FIBER CABLING FROM MECHANICAL DAMAGE. INSTALL CONDUITS FOR COMMUNICATIONS WITH LONG RADIUS BENDS, BUSHED ENDS THAT ARE GROUNDED AND BONDED AS PER CODES AND STANDARDS.

3.) CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR AND COMMUNICATIONS TRADE ON CONDUIT AND CABLE TRAY ROUTING FOR COMMUNICATIONS CABLES PRIOR TO INSTALLATION OF PATHWAYS TO ENSURE CABLE PATHWAYS DO NOT CAUSE CABLE LENGTHS TO EXCEED MAXIMUM DISTANCES. IN GENERAL, CONDUITS FROM CABLE TRAY TO TELECOM OUTLETS SHOULD BE THE MOST DIRECT ROUTE POSSIBLE FOLLOWING BUILDING LINES.

4.) CONTRACTOR SHALL INSTALL A TIED OFF NYLON PULL STRING IN ALL CONDUITS. ALL CONDUITS SHALL BE COMPLETE WITH BUSHINGS.

5.) CONDUITS SHALL NOT EXCEED 180° OF BENDS BETWEEN PULL POINTS. INSTALL PERMANENTLY ACCESSIBLE PULL BOXES AS REQUIRED TO MEET THIS REQUIREMENT. DO NOT CHANGE DIRECTION OR BEND WITHIN A JUNCTION BOX OR PULL BOX.

6.) GROUNDING AND BONDING:

A.) BUILDING GROUNDING SYSTEM BY ELECTRICAL CONTRACTOR.

B.) REFER TO ELECTRICAL SERIES DRAWINGS AND SPECIFICATIONS FOR OTHER COMMUNICATION GROUNDING REQUIREMENTS AND INFO ON INSTALLATION OF MATERIALS AND HARDWARE.

C.) DISSIMILAR METALS BONDED TO EACH OTHER AND APT TO CORRODE IN NORMAL ENVIRONMENTAL CONDITIONS SHALL BE SEPARATED BY A CONDUCTIVE MATERIAL SPACER TO PREVENT CORROSION. REFER TO SPECIFICATIONS FOR OTHER GROUNDING REQUIREMENTS.

D.) BUS BARS SHALL BE PRE-DRILLED WITH STANDARD NEMA BOLT HOLE SIZING & SPACING FOR CONNECTIONS OF THE BONDING CONDUCTORS TO THE BUSBAR.

8.) IDENTIFICATION:

A.) IDENTIFY ALL BOXES AND CONDUIT FOR COMMUNICATIONS WITH A DISTINCTIVE COLOR OR MARKING FOR EASY IDENTIFICATION. IDENTIFICATION SHALL BE DIFFERENT FROM OTHER TRADES.

COMMUNICATION NOTES

1.) THE TELECOMMUNICATIONS CONTRACTOR SHALL REVIEW ALL CONSTRUCTION DOCUMENTS FOR RELATED SECTIONS, WHICH MAKE UP THE CONTRACT DOCUMENTS AND SHALL COORDINATE ALL COMMUNICATIONS WORK ON THE COMMUNICATIONS PLANS WITH ANY COMMUNICATIONS SECTIONS OF RELATED DRAWINGS AND SPECIFICATIONS.

A.) STRUCTURED CABLING REQUIREMENTS FOR THE PROJECT ARE THE RESPONSIBILITY OF THE COMMUNICATIONS CABLING CONTRACTOR UNLESS OTHERWISE NOTED. COORDINATE WITH ALL TRADES THAT APPLY. REFER TO MEP, AND SECURITY SHEETS FOR ADDITIONAL CABLING REQUIREMENTS.

2.) TELECOMMUNICATIONS CONTRACTOR, CABLING CONTRACTOR, OR COMMUNICATIONS CONTRACTOR SHALL HERE AFTER BE REFERRED TO AS CONTRACTOR UNLESS OTHERWISE NOTED.

3.) CONTRACTOR SHALL PROVIDE ALL MATERIALS, COMPONENTS, TOOLS, AND LABOR NECESSARY TO COMPLETE THIS INFRASTRUCTURE INSTALLATION.

4.) ALL COMMUNICATIONS CONDUIT PATHWAYS ARE BY ELECTRICAL CONTRACTOR.

5.) TELECOM CONTRACTOR SHALL PROVIDE 'J' HOOKS ON THREADED ROD RATED FOR SUPPORTING DATA CABLING THAT IS NOT IN CONDUIT. CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR ON CABLE PATHS PRIOR TO INSTALLATION OF CABLING.

6.) ALL EXISTING CABLE SHALL BE REMOVED FROM THE BUILDING.

COMMUNICATIONS CABLING:

1.) ALL UTP HORIZONTAL CABLING MUST BE WITHIN A PHYSICAL LENGTH OF 295'.

2.) PROVIDE ALL NECESSARY MEANS TO PROTECT ALL COPPER/FIBER CABLING AND JACK/PORTS FROM MECHANICAL DAMAGE AND DUST DURING CONSTRUCTION.

3.) FIBER BACKBONE/RISER CABLE SHALL BE INSTALLED IN CONDUIT OR ON LADDER RUNWAY UNLESS IT IS ARMORED.

4.) COORDINATE WITH GENERAL CONTRACTOR FOR SYSTEM FURNITURE WORKSTATIONS TO PROVIDE REQUIRED BRACKETS TO INSTALL AND TERMINATE COMMUNICATIONS CABLING, JACKS AND FACE PLATES.

5.) CABLING CONTRACTOR RESPONSIBLE FOR FINAL CONNECTION, TERMINATION AND TESTING TO THE DATA OUTLETS IN LAB BENCHES AND MODULAR FURNITURE, INCLUSIVE OF PATCH CORD ROUTING.

6.) CABLING CONTRACTOR SHALL CONFIRM ALL CABLE LENGTHS PRIOR TO BID AND ROUGH-IN

COMMUNICATIONS ROOMS:

1.) REFERENCE GENERAL NOTES FOR PLYWOOD REQUIREMENTS.

2.) CONTRACTOR TO PROVIDE CABINETS, HORIZONTAL CABLE RUNWAYS AND MANAGERS, VERTICAL CABLE MANAGERS, TERMINATION HARDWARE, POWER STRIPS FOR RACKS, TERMINATION, LABELING, AND TESTING AS SPECIFIED IN CONTRACT DOCUMENTS.

3.) GRAPHIC REPRESENTATION OF PATCH PANELS, BLOCKS, VERTICAL, AND HORIZONTAL CORD MANAGEMENT DO NOT REPRESENT EXACT QUANTITIES. CONTRACTOR SHALL PROVIDE SUFFICIENT QUANTITIES FOR ALL CABLING, PLUS 20% GROWTH. (REFER ALSO TO SPECIFICATIONS).

GROUNDING AND BONDING:

1.) CONTRACTOR SHALL BOND ALL METALLIC COMPONENTS TO BUS BAR IN THE FOLLOWING MANNER:

A.) CONTRACTOR SHALL INSTALL A BONDING CONDUCTOR FROM BUS BAR TO THE COMMUNICATIONS CABINET.

B.) BONDING SHALL BE IN AN APPROVED MANNER.

C.) DISSIMILAR METALS BONDED TO EACH OTHER AND APT TO CORRODE IN NORMAL ENVIRONMENTAL CONDITIONS SHALL BE SEPARATED BY A CONDUCTIVE MATERIAL SPACER TO PREVENT CORROSION. REFER TO SPECIFICATIONS FOR OTHER GROUNDING REQUIREMENTS.

FIRESTOPPING:

1.) COORDINATE ANY AND ALL FIRESTOPPING WITH THE GENERAL CONTRACTOR BEFORE PROCEEDING WITH ANY WORK INVOLVING FIRESTOPPING.

2.) ALL FIRESTOPPING SHALL CONFORM TO THE SPECIFICATIONS AND RECOMMENDATIONS OF THERMAL AND MOISTURE PROTECTION ON FIRESTOPPING OF THROUGH PENETRATION SYSTEMS IN THE CONSTRUCTION SPECIFICATIONS DOCUMENT.

3.) SOLUTIONS AND SHOP DRAWINGS/SUBMITTALS FOR FIRE STOP MATERIALS AND SYSTEMS SHALL BE PRESENTED TO THE GENERAL CONTRACTOR FOR WRITTEN APPROVAL OF MATERIAL & SYSTEMS PRIOR TO PURCHASE AND INSTALLATION. ALL MATERIALS AND SYSTEMS SHALL BE COMPLETE, UL LISTED FOR INTENDED INSTALLATION, AND PROVIDE APPROPRIATE RATING AT THE COMPLETION OF JOB.

4.) SEAL ALL PENETRATIONS THROUGH FIRE-RATED BARRIERS (CONDUITS, SLEEVES, SLOTS, CHASES) CREATED BY OR MADE FOR OR ON THE BEHALF OF THE TELECOMMUNICATIONS CONTRACTOR TO PREVENT THE PASSAGE OF SMOKE, FIRE, TOXIC GAS, OR WATER THROUGH PENETRATIONS.

5.) CONTRACTOR SHALL PROVIDE TRAINING MANUALS WHICH INCLUDE INSTRUCTIONS ON METHODS OF ADDING OR REMOVING CABLING TO/FROM FIRESTOPPED SLEEVES AND CHASES.

6.) LAMINATE AND PERMANENTLY AFFIX TO EACH COMMUNICATIONS ROOM WALL ADJACENT TO CHASES THE FOLLOWING INFORMATION:

A.) NAME OF MANUFACTURER OF FIRE STOP SYSTEM.

B.) PART & MODEL NUMBERS OF SYSTEM AND ALL COMPONENTS.

C.) PHONE NUMBERS OF MANUFACTURER'S CORPORATE HEADQUARTERS IN U.S. AND LOCAL DISTRIBUTOR'S NAME AND NUMBER.

LEGEND

- WALL DATA INFORMATION OUTLET. NUMBER(#) DENOTES QUANTITY OF CABLES.
- WALL PHONE (VOICE) OUTLET AT 48" AFF.
- FLOOR-BOX DATA INFORMATION OUTLET. NUMBER(#) DENOTES QUANTITY OF CABLES.
- DATA OUTLET FOR WIRELESS ACCESS POINT (WAP) CONNECTIVITY ABOVE LAY-IN CEILING. TERMINATE WITH MODULAR CONNECTORS AND LABEL.
- WALL DATA OUTLET FOR SECURITY DEVICE. REFER TO SECURITY DRAWINGS AND SPECIFICATIONS FOR EXACT PLACEMENT.
- CEILING DATA OUTLET FOR FOR SECURITY DEVICE. REFER TO SECURITY DRAWINGS AND SPECIFICATIONS FOR EXACT PLACEMENT.

ABBREVIATIONS

BAS:	BUILDING AUTOMATION SYSTEM
BET:	BUILDING ENTRANCE TERMINAL
DIV 01:	GENERAL REQUIREMENTS
DIV 07:	THERMAL & MOISTURE PROTECTION
DIV 23:	HEATING, VENTILATING, AND AIR-CONDITIONING
DIV 25:	INTEGRATED AUTOMATION
DIV 26:	ELECTRICAL
TR:	TELECOMMUNICATIONS ROOM
ER:	EQUIPMENT ROOM
TBB:	TELECOM BONDING BACKBONE
TBC:	TELECOM BONDING CONDUCTOR
SBB:	SECONDARY BONDING BUSBAR
TMBC:	TELECOM MAIN BONDING CONDUCTOR
PBB:	PRIMARY BONDING BUSBAR
TMH:	TELECOMMUNICATIONS MANHOLE
UTP:	UNSHIELDED TWISTED PAIR
WAP:	WIRELESS ACCESS POINT
SIM:	SIMILAR

DRAWING LIST

T.001	LEGEND AND NOTES - COMMUNICATIONS
T.010	SITE PLAN - COMMUNICATIONS
T.100	OVERALL FIRST FLOOR PLAN - COMMUNICATIONS

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CHECKED BY: KO

ISSUE:

06/14/2024	DESIGN DEVELOPMENT
08/23/2024	90% CONSTRUCTION DOCUMENTS
09/23/2024	ISSUE FOR BID & PERMIT

LEGEND AND NOTES - COMMUNICATIONS

Scale: AS NOTED

T.001

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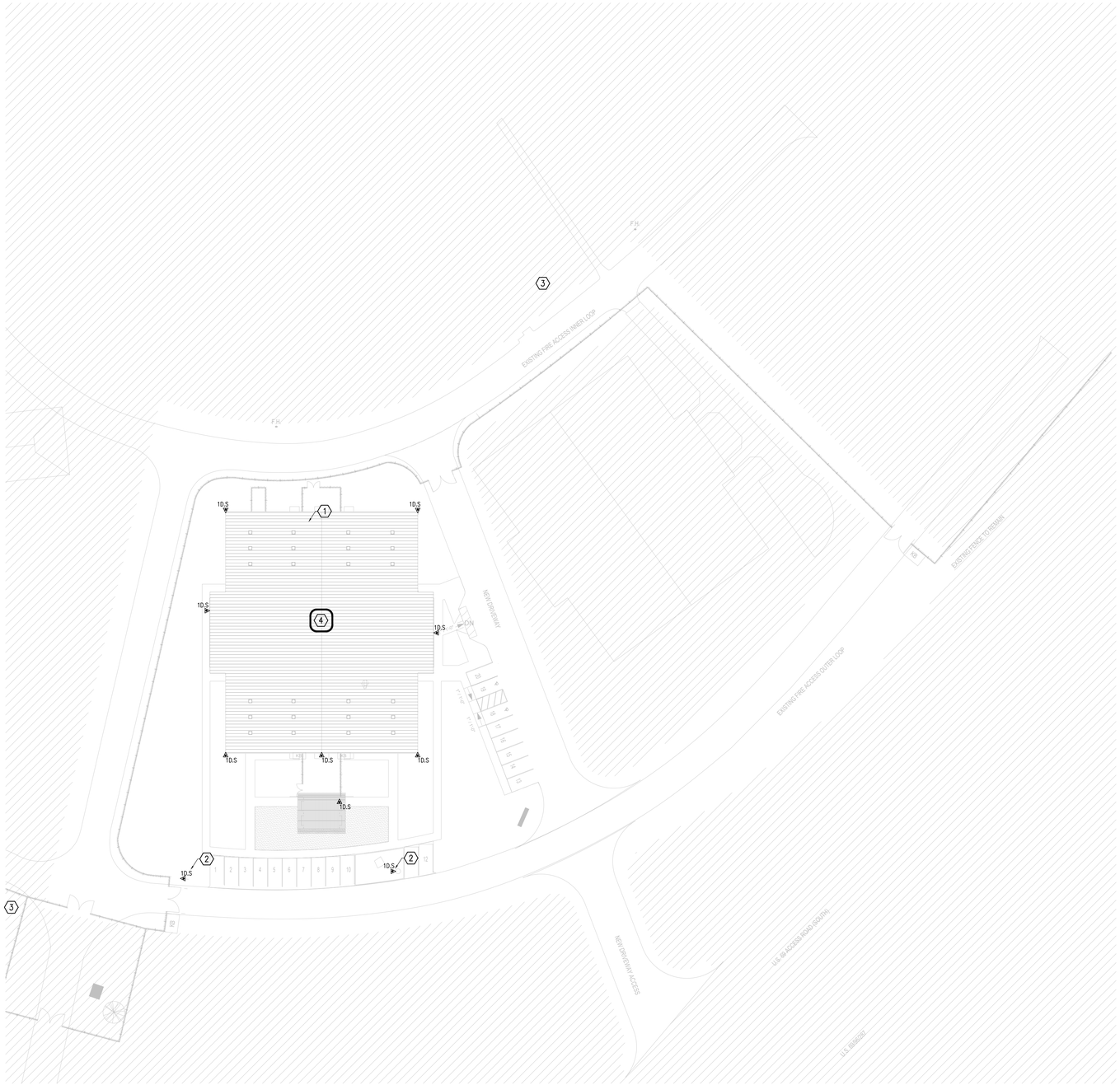
GENERAL NOTES:

1.) FINAL LOCATION OF CONDUITS, IN GROUND TELECOM MAINTENANCE HOLES, SECURITY GATES ARE TO BE DETERMINED.

2.) INCOMING FIBER OPTIC CABLE SERVICE IS LOCATED IN THE MECHANICAL ROOM.

KEYED NOTES:

1. AT&T WILL PROVIDE FIBER OPTIC SERVICE TO THE BUILDING. CURRENT TELECOM CABLE ENTERS THE MECHANICAL ROOM.
2. PROVIDE 2" CONDUIT FROM BUILDING TO EACH CAMERA AT THE EXISTING POLES. TURN UP CONDUIT AT POLE AND PROVIDE A RATED ENCLOSURE FOR POWER AND DATA CONNECTIVITY. REFER TO SECURITY DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL COORDINATION.
3. APPROXIMATE LOCATION OF A TELECOMMUNICATIONS MANHOLE. REFER TO THE SITE SURVEY.
4. CONTROL ROOM – CABINET LOCATION



SITE PLAN - COMMUNICATIONS 1/32" = 1'-0" 5

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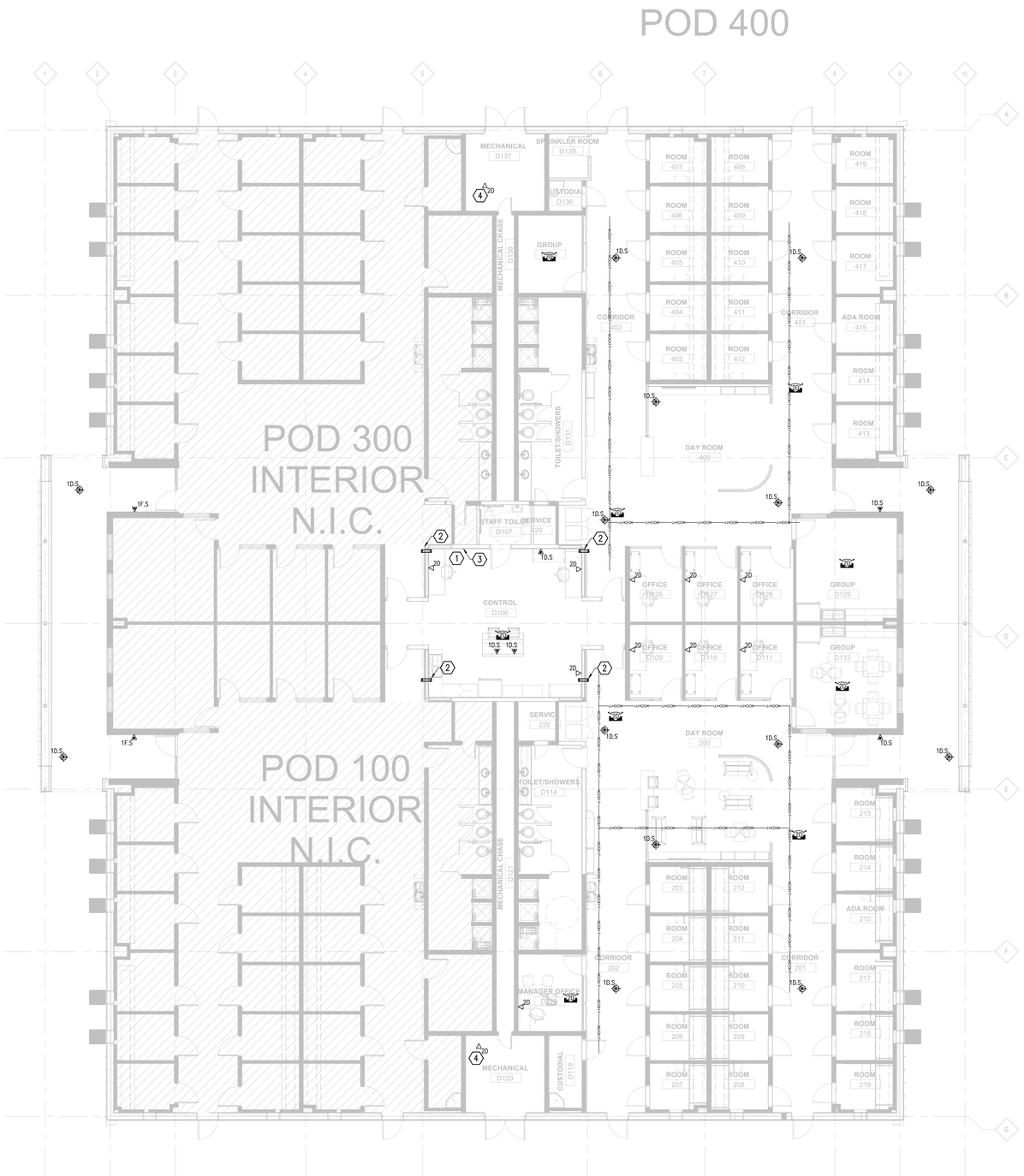
SITE PLAN - COMMUNICATIONS

Scale: AS NOTED

T.010



GENERAL NOTES:

1.) ALL CABLE SHALL BE PLENUM RATED UNLESS NOTED OTHERWISE.

2.) J-HOOK PATHWAY IS SHOWN FOR REFERENCE ONLY. IT IS NOT A DEPICTION OF HOW THE SUPPORTS SHOULD BE INSTALLED. ALL J-HOOKS SPACING SHALL ADHERE TO INDUSTRY STANDARDS OF 4-5 FEET ON CENTER. CABLE SAG BETWEEN J-HOOKS SHALL BE NO MORE THAN 6-INCHES.

3.) ALL DATA CABLE IN MECHANICAL ROOMS, ELECTRICAL ROOMS, FIRE SUPPORT SYSTEM ROOMS, ETC. SHALL BE FULLY INSTALLED IN CONDUIT

KEYED NOTES:

1. NEW CABINET LOCATION.
2. ABOVE CEILING 4"ø CONDUIT SLEEVE COMPLETE WITH BUSHINGS ON EACH END.
3. GROUNDING BUSBAR MOUNTED TO PLYWOOD.
4. DATA FOR BUILDING MONITORING SYSTEMS

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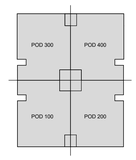
KEYPLAN:



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OVERALL FIRST FLOOR PLAN - COMMUNICATIONS

Scale: AS NOTED

T.100

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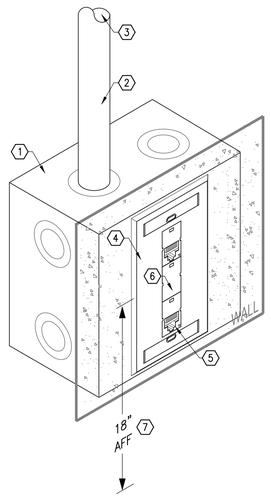
KEYED NOTES:

1. RECESSED DOUBLE GANG BOX (4 1/16"X4 1/16"X2 3/8") WITH SINGLE GANG REDUCTION PLATE. (BY DIV 26)
2. 1¼"ø CONDUIT WITH 200 LBS ¼" POLYLINE PULL STRING. (BY DIV 26)
3. END OF CONDUIT DEBURRED AND FITTED WITH PROTECTIVE GROMMET. (BY DIV 26)
4. STRUCTURED CABLING, OUTLETS, COVER PLATES, AND JACKS SUPPLIED AND INSTALLED BY COMMUNICATION CONTRACTOR. COORDINATE COVERPLATES COLOR WITH ARCHITECT.
5. PROVIDE RJ-45 JACK FOR EACH CABLE.
6. FILL UNUSED POSITIONS WITH BLANKS.
7. COORDINATE EXACT MOUNTING HEIGHT WITH ARCHITECT/GC.

NOTE: IN SOME INSTANCES THIS BOX WILL BE SURFACE MOUNTED. FOLLOW SAME INSTALLATION METHODOLOGIES AS ELECTRICAL.

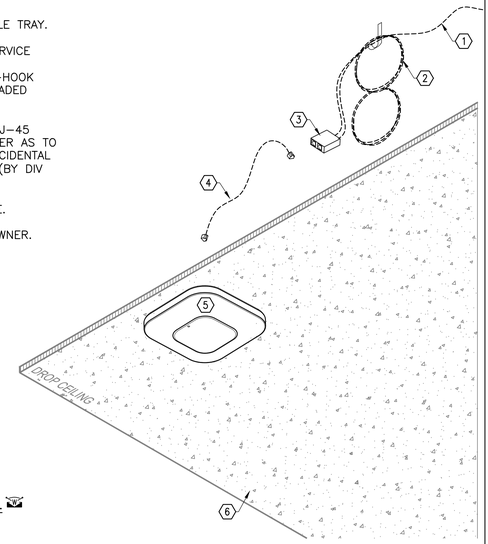


1 T401 TYPICAL FACEPLATE DETAIL (20▷)
Not To Scale

2 T401 NOT USED
Not To Scale

KEYED NOTES:

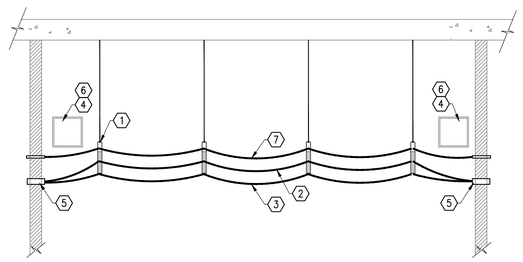
1. (2)CATEGORY 6 CABLE TO CABLE TRAY.
2. UTP CABLE. PROVIDE A 15' SERVICE LOOP IN A FIGURE EIGHT IN ACCESSIBLE CEILING SPACE. J-HOOK ATTACHED TO DECK WITH THREADED ROD.(BY DIV 27)
3. FREE FLOATING BISCUIT WITH RJ-45 JACK. PLACE IN SUCH A MANNER AS TO MAXIMIZE PROTECTION FROM INCIDENTAL CONTACT AFTER INSTALLATION. (BY DIV 27)
4. OWNER PROVIDED PATCH CABLE.
5. WIRELESS ACCESS POINT BY OWNER.
6. SCHEDULED CEILING.



3 T4.01 WIRELESS CABLING DETAIL
Not To Scale

KEYED NOTES:

1. J-HOOK WITH SYSTEM SUPPORT BAR OR THREADED ROD.
2. VOICE COMMUNICATIONS CABLE WITH 3"-5" SAG BUNDLED SEPARATE FROM DATA.
3. DATA COMMUNICATIONS CABLE WITH 3"-5" SAG BUNDLED SEPARATE FROM VOICE.
4. POTENTIAL HVAC OBSTRUCTIONS.
5. CONDUIT SLEEVE OR E-Z PATH THROUGH WALLS. CONTRACTOR SHALL ENSURE THERE ARE NO OBSTRUCTIONS FOR COMMUNICATIONS CABLING.
6. COMMUNICATIONS CABLING SHALL BE REROUTED THROUGH CONDUIT IN CASE OF OBSTRUCTION.
7. OTHER LOW VOLTAGE CABLING SUPPORTED SEPARATE FROM COMMUNICATIONS CABLING.

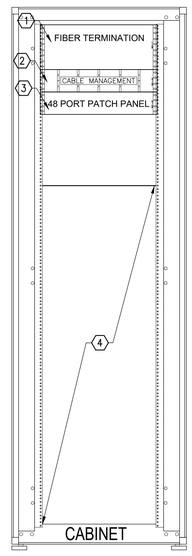


4 T401 CABLE SUPPORT AND PATHWAY DETAIL
Not To Scale

KEYED NOTES:

1. FIBER ENCLOSURE
2. HORIZONTAL WIRE MANAGER
3. CATEGORY 6 PATCH PANEL.
4. RESERVED FOR OWNER EQUIPMENT

NOTE: POWER AND GROUNDING BUSBAR IN THE CONTROL ROOM IS BY DIVISION 26.



5 T401 COMMUNICATIONS CABINET
Not To Scale

6 T401 NOT USED
Not To Scale

7 T401 NOT USED
Not To Scale

8 T401 NOT USED
Not To Scale

9 T401 NOT USED
Not To Scale

JC DIVERSION CENTER RENOVATION

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GENERAL DETAILS - COMMUNICATIONS

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T.401

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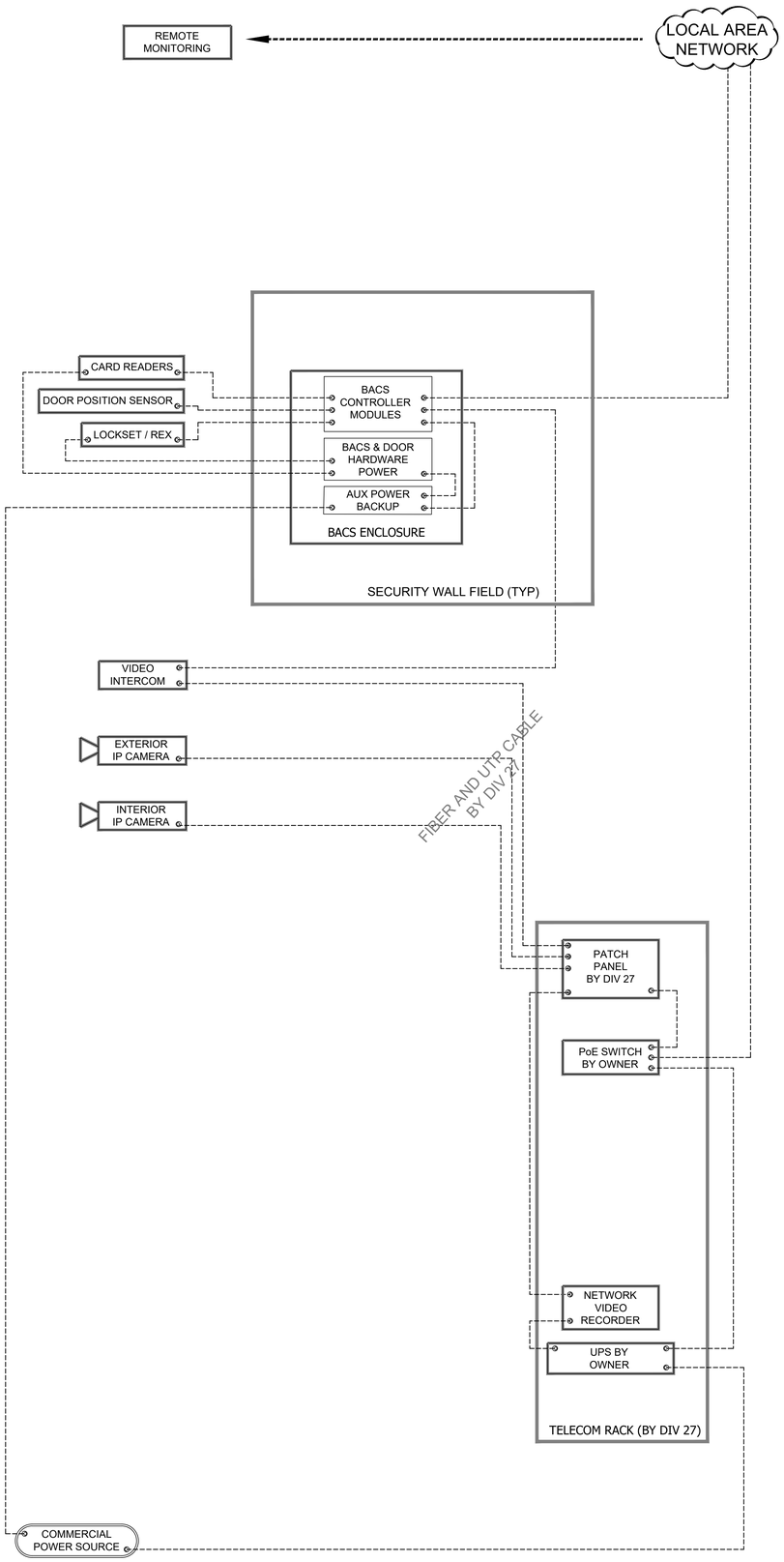
SECURITY BLOCK DIAGRAM



SECURITY NOTES

GENERAL CONTRACTOR NOTES:

1.) THE GENERAL CONTRACTOR IS RESPONSIBLE TO INSURE THAT ALL DIVISIONS AND TRADES ARE AWARE OF WORK REQUIRED TO SUPPORT THE INSTALLATION OF RELATED SYSTEMS AND SUB-SYSTEMS.

2.) CONTRACTORS ARE RESPONSIBLE TO REVIEW ALL RELATED SPECIFICATIONS AND DRAWINGS.

SECURITY SYSTEM SUMMARY:

1.) BUILDING ACCESS CONTROL SYSTEM (BACS)

A.) CARD ACCESS SYSTEM MONITORED AND MAINTAINED BY <OWNER>.

B.) CARD READERS, DOOR POSITION SWITCHES, DATA GATHERING PANELS, LOCK POWER SUPPLY, AND SECURITY CABLING BY SECURITY CONTRACTOR.

C.) INTEGRATION WITH EXISTING GENETEC SYSTEM BY SECURITY CONTRACTOR WITH CLOSE COORDINATION WITH <OWNER>.

2.) VIDEO SURVEILLANCE MANAGEMENT SYSTEM (VMS)

A.) EXISTING VMS MONITORED AND MAINTAINED BY <OWNER>.

B.) IP CAMERAS, MOUNTS, AND CAMERA CONFIGURATION/FOCUS BY SECURITY CONTRACTOR.

C.) PROGRAMMING, SYSTEM CAMERA LICENSING, AND INTEGRATION BY SECURITY CONTRACTOR.

D.) HEAD END NVR EQUIPMENT BY SECURITY CONTRACTOR.

E.) UTP AND OSP FIBER CABLING BY DIVISION 27.

F.) PoE SWITCHES BY <OWNER>.

3.) EMERGENCY PHONES AND INTERCOMS

A.) EXISTING PHONES MONITORED AND MAINTAINED BY <OWNER>.

B.) MASTER STATION AND DOOR STATIONS BY SECURITY CONTRACTOR.

C.) PROGRAMMING AND PHONE SYSTEM INTEGRATION BY SECURITY CONTRACTOR.

C.) INTEGRATION AND REMOTE DOOR CONTROL BY SECURITY CONTRACTOR.

D.) UTP CABLING BY DIVISION 27.

SECURITY NOTES:

1.) THE SECURITY INTEGRATOR (SUBCONTRACTOR) SHALL REVIEW ALL CONSTRUCTION DOCUMENTS FOR RELATED SECTIONS, WHICH MAKE UP THE CONTRACT DOCUMENTS AND SHALL COORDINATE ALL WORK ON THE ELECTRONIC SECURITY PLANS WITH ANY ELECTRONIC SECURITY SECTIONS OF RELATED DRAWINGS AND SPECIFICATIONS.

A.) ELECTRONIC SECURITY REQUIREMENTS FOR THE PROJECT ARE THE RESPONSIBILITY OF THE SECURITY INTEGRATOR (SUBCONTRACTOR) UNLESS OTHERWISE NOTED.

B.) COORDINATE WITH ALL TRADES THAT APPLY. REFER TO MEP AND COMMUNICATIONS SHEETS FOR PATHWAY AND PENETRATION REQUIREMENTS.

C.) REFER TO COMMUNICATIONS SHEETS FOR ADDITIONAL CABLING REQUIREMENTS.

2.) ALL COMPONENTS AND DEVICES SHOWN ON THESE DRAWINGS ARE FOR APPROXIMATE LOCATION AND POSITIONING ONLY. VERIFY EXACT LOCATIONS WITH THE OWNER OR G.C. PRIOR TO INSTALLATION.

3.) ALL PRIMARY SECURITY WIRING PATHWAYS OUTSIDE OF SECURITY ROOMS SHALL BE BY ELECTRICAL CONTRACTOR. ALL CONDUIT RUNS SHALL BE FROM THE INSTALLED SECURITY DEVICE LOCATION TO THE NEAREST ACCESSIBLE CEILING SPACE.

4.) CONTRACTOR SHALL COORDINATE WITH TELECOMMUNICATIONS CONTRACTOR AND CONSULT THE TELECOMMUNICATIONS DRAWINGS. INSTALL J-HOOKS AS REQUIRED TO SUPPORT SECURITY CABLING.

5.) PROVIDE ALL NECESSARY MEANS TO PROTECT ALL SECURITY CABLING AND CONNECTORS FROM MECHANICAL DAMAGE, DUST AND DIRT DURING CONSTRUCTION.

6.) FIRE PANEL CONNECTIVITY AND PROGRAMMING BY FIRE ALARM CONTRACTOR.

7.) SECURITY INTEGRATOR SHALL COORDINATE ANY INSTALLATION IN TELECOM ROOMS WITH OWNER IT DEPARTMENT.

8.) SHIELDED AND SCREENED CABLES SHALL HAVE THEIR SHIELD'S GROUNDED PER MANUFACTURER'S INSTRUCTION. WHEN SHIELD GROUNDS ARE REQUIRED AT ONE END ONLY, THEY SHALL BE GROUNDED AT THE DGP (MASTER PANEL WHEN REMOTE PANELS ARE USED), WITH THE OTHER END OF THE CABLE, INSULATED TO PREVENT SHIELD GROUNDING.

9.) ALL METALLIC DATA, SIGNALING AND POWER CONDUCTORS FOR ROOF, FENCE AND POLE/TOWER MOUNTED DEVICES/SENSORS SHALL HAVE SURGE SUPPRESSORS WITH MANUFACTURER RECOMMENDED GROUNDING AT BOTH THE DEVICE AND TERMINATION ENDS.

10.) ALL POWER SUPPLIES NOT FED FROM A UPS SHALL HAVE EXTERNAL SURGE SUPPRESSORS WITH MANUFACTURER RECOMMENDED GROUNDING.

ELECTRICAL CONTRACTOR NOTES:

1.) ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE THE FOLLOWING FOR SECURITY INFRASTRUCTURE: CONDUIT, SLEEVES, WALL, AND FLOOR BOXES. REFER TO ELECTRICAL AND TELECOMMUNICATIONS DRAWINGS.

A.) PROVIDE AND INSTALL WALL MOUNTED ¾" FIRE RETARDANT PLYWOOD FOR ALL SECURITY PANEL LOCATIONS. APPLY WHITE OR LIGHT COLORED PAINT TO ALL SIDES OF PLYWOOD PRIOR TO INSTALLATION. (BY ELECTRICAL CONTRACTOR, OR AS DESIGNATED BY C.M.)

B.) REFER TO ARCHITECTURAL DRAWINGS TO COORDINATE WALL AND CABINETRY BOX LOCATIONS.

C.) ALL BOXES INSTALLED FOR SECURITY SHALL HAVE CONDUITS INSTALLED FROM BACK BOX TO NEAREST ACCESSIBLE CEILING SPACE AT A POINT THAT ALLOWS ADEQUATE VERTICAL WORK ROOM.

2.) CONTRACTOR SHALL PROVIDE RACEWAY INSTALLATION IN A MANNER THAT WILL PROTECT ALL SECURITY CABLING FROM MECHANICAL DAMAGE. INSTALL CONDUITS FOR SECURITY WITH LONG RADIUS BENDS AND BUSHED ENDS.

3.) PROVIDE DEDICATED RECEPTACLE CIRCUITS LOCATED ON OR NEAR EACH EQUIPMENT RACK LOCATED IN THE SECURITY ROOMS. SEE DRAWINGS FOR EXACT LOCATIONS.

4.) CONTRACTOR SHALL INSTALL A TIED OFF NYLON PULL STRING IN ALL CONDUITS.

5.) IDENTIFICATION:

A.) SPRAY ALL BOXES AND CONDUIT FOR SECURITY WITH A DISTINCTIVE COLOR FOR EASY IDENTIFICATION. COLOR SHALL BE DIFFERENT FROM OTHER TRADES.

LEGEND

- WALL MOUNTED CARD READER
- MULLION MOUNTED CARD READER
- DOOR POSITION SENSOR.
- REQUEST TO EXIT. (REX) (BY DIV 08)
- DOOR/OPENING CALLOUT. REFER TO DESIGNATED DETAIL.
- INTERIOR DOME SURVEILLANCE CAMERA WITH A MINIMUM 2MP RESOLUTION (1080P). INTERIOR DOME MULTI DIRECTIONAL SURVEILLANCE CAMERA WITH A MINIMUM 2MP RESOLUTION (1080P).
- 360° WIDE ANGLE MULTI-SENSOR INTERIOR DOME SURVEILLANCE CAMERA WITH A MINIMUM 2MP PER SENSOR RESOLUTION (8MP MIN).
- EXTERIOR DOME SURVEILLANCE CAMERA WITH A MINIMUM 2MP (1080P) RESOLUTION. PROVIDE ENVIRONMENTALLY CONTROLLED ENCLOSURE.
- 180° WIDE ANGLE MULTI-SENSOR EXTERIOR DOME SURVEILLANCE CAMERA WITH 3-5MP IMAGERS. PROVIDE ENVIRONMENTALLY CONTROLLED ENCLOSURE.
- 270° WIDE ANGLE MULTI-SENSOR EXTERIOR DOME SURVEILLANCE CAMERA WITH 3 DIRECTIONAL IMAGERS AT 3-5MP AND 4TH IMAGER POINTED DOWN AT 1-2MP. PROVIDE ENVIRONMENTALLY CONTROLLED ENCLOSURE.
- INTERCOM WITH ACS INTEGRATION.
- ACCESS CONTROL SYSTEM MONITORING WORKSTATION AND MONITORS.
- VIDEO MANAGEMENT SYSTEM MONITORING WORKSTATION AND MONITORS.
- FUTURE INTERCOM WITH ACS INTEGRATION.

ABBREVIATIONS

AC:	ACCESS CONTROL
APS:	ACCESS CONTROL SYSTEM POWER SUPPLY
CCTV:	CLOSED CIRCUIT TELEVISION
CPS:	CAMERA POWER SUPPLY
CPU:	CENTRAL PROCESSING UNIT
CR:	CARD READER
DGP:	DATA GATHERING PANEL
DVR:	DIGITAL VIDEO RECORDER
DIV 01:	GENERAL REQUIREMENTS
DIV 08:	OPENINGS
DIV 26:	ELECTRICAL
DIV 27:	COMMUNICATIONS
DP:	DOOR POSITION SENSOR
FOV:	FIELD OF VIEW - CAMERA PICTURE
GB:	GLASS BREAK DETECTOR
ID:	INTRUSION DETECTION
KVM:	KEYBOARD-VIDEO-MOUSE SWITCH
KP:	INTRUSION DETECTION KEYPAD
LPR:	LICENSE PLATE RECOGNITION
LPS:	LOCK POWER SUPPLY
MD:	MOTION DETECTOR
MP:	MEGAPIXEL - CAMERA RESOLUTION
NVR:	NETWORK VIDEO RECORDER
OFCI:	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI:	OWNER FURNISHED, OWNER INSTALLED
PoE:	POWER OVER ETHERNET
PP:	TELECOMMUNICATIONS PATCH PANEL
TR:	TELECOMMUNICATIONS ROOM
TCP/IP:	TRANSFER CONTROL/INTERNET PROTOCOL
UPS:	UNINTERRUPTIBLE POWER SUPPLY
UTP:	UNSHIELDED TWISTED PAIR
VMS:	VIDEO MANAGEMENT SYSTEM

DRAWING LIST

SC.001	LEGEND AND NOTES - SECURITY
SC.010	SITE PLAN - SECURITY
SC.100	OVERALL FIRST FLOOR PLAN - SECURITY
SC.301	DOOR ELEVATION DETAILS - SECURITY
SC.302	DOOR ELEVATION DETAILS - SECURITY
SC.401	GENERAL DETAILS - SECURITY
SC.402	GENERAL DETAILS - SECURITY

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LEGEND AND NOTES - SECURITY

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SC.001

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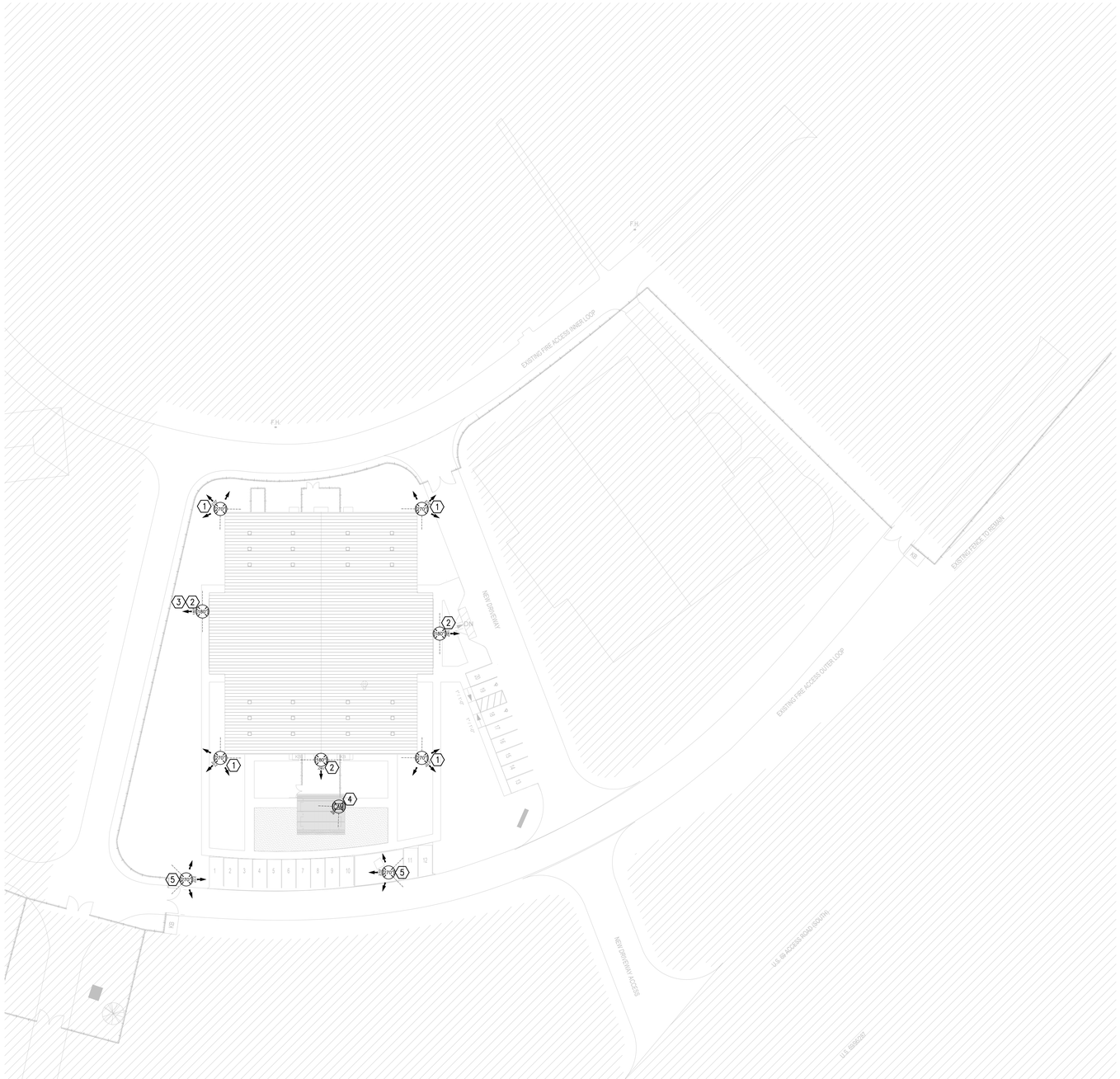
GENERAL NOTES:

1.) SECURITY CAMERAS TO ROUTE TO TELECOMMUNICATION CABINET LOCATED IN THE CONTROL ROOM D106. (BY DIV. 27)

KEYED NOTES:

1. EXTERIOR CORNER MOUNT SECURITY CAMERA.
2. EXTERIOR WALL MOUNT SECURITY CAMERA.
3. COORDINATE CAMERA MOUNTING LOCATION WITH LANDSCAPING TO PREVENT CAMERA VIEWS BEING BLOCKED BY TREES.
4. EXTERIOR SECURITY CAMERA TO BE MOUNTED ON TRELLIS SHADE STRUCTURE. COORDINATE MOUNTING WITH STRUCTURE AND ARCHITECTURAL.
5. POLE MOUNT SECURITY CAMERA. CAMERA TO BE MOUNTED ON EXISTING LIGHT POLE.



SITE PLAN - SECURITY 1/32" = 1'-0" 5

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SITE PLAN - SECURITY

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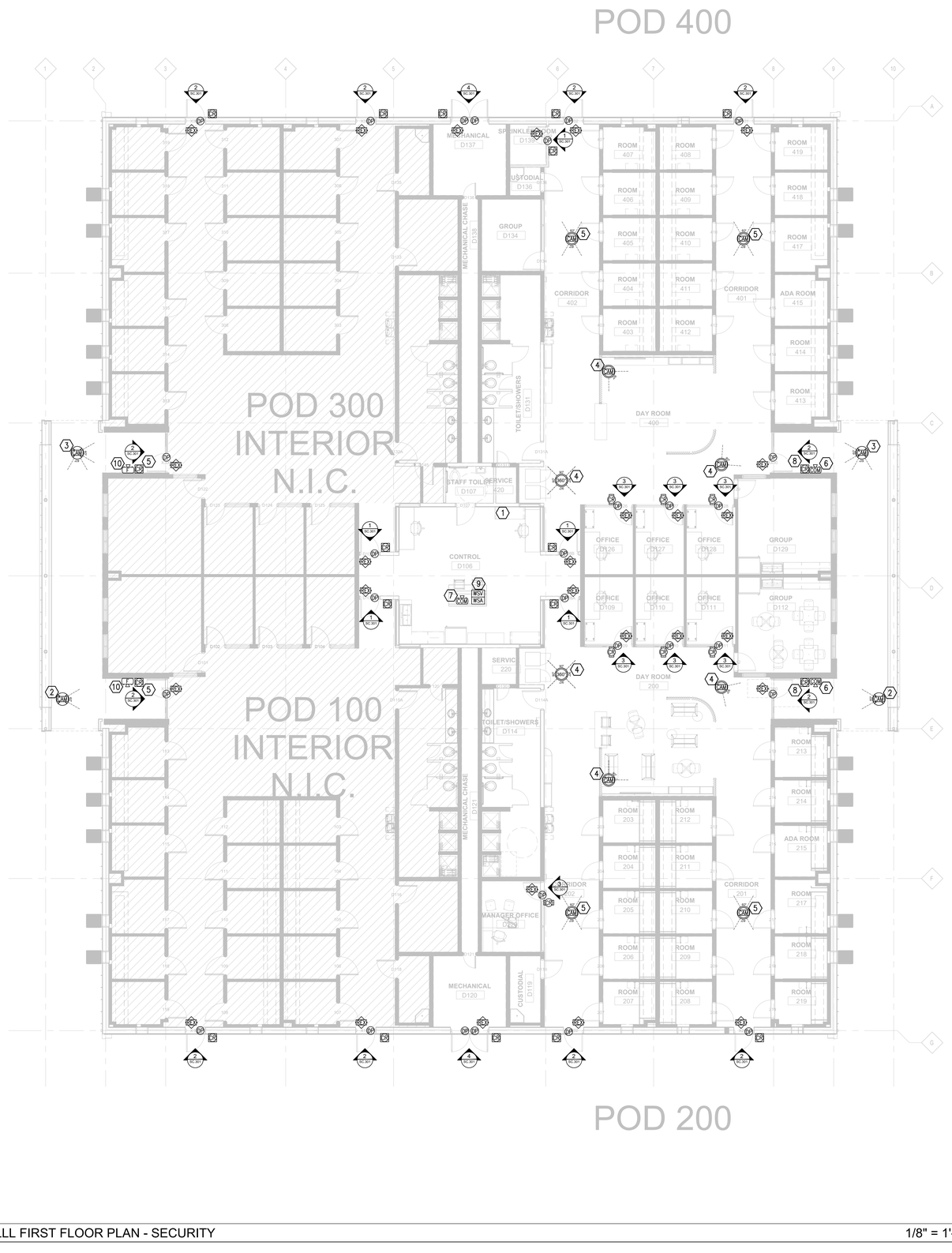

GENERAL NOTES:

1.) SECURITY CAMERAS TO ROUTE TO TELECOMMUNICATION CABINET LOCATED IN THE CONTROL ROOM D106. (BY DIV. 27)

2.) SECURITY DEVICES TO ROUTE TO HEAD END EQUIPMENT LOCATED THE CONTROL ROOM D106.

KEYED NOTES:

1. SECURITY WALL FIELD LOCATION. EACH DGP REQUIRES ONE ONE DATA CIRCUIT. (BY DIV 27). EACH PANEL REQUIRES A DEDICATED 120VAC CIRCUIT WITH DEDICATED GROUND ON EMERGENCY POWER. (BY DIV 26)
2. EXTERIOR SOFFIT MOUNT SECURITY CAMERA.
3. EXTERIOR SOFFIT MOUNT MULTI DIRECTIONAL SECURITY CAMERA.
4. INTERIOR CEILING MOUNT SECURITY CAMERA.
5. INTERIOR CEILING MOUNT MULTI DIRECTIONAL SECURITY CAMERA.
6. SURFACE MOUNT VIDEO INTERCOM SUB-STATION.
7. VIDEO INTERCOM MASTER STATION WITH DOOR RELEASE CAPABILITY. MASTER STATION TO RELEASE EXTERIOR DOORS X100, X200, X300 AND X400.
8. SURFACE MOUNT CARD READER.
9. WORKSTATION TO VIEW VIDEO SURVEILLANCE AND ACCESS CONTROL.
10. PROVIDE INFRASTRUCTURE FOR FUTURE SURFACE MOUNT VIDEO INTERCOM SUB-STATION.

OVERALLL FIRST FLOOR PLAN - SECURITY | 1/8" = 1'-0" | 5

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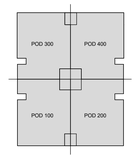

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OVERALLL FIRST FLOOR PLAN - SECURITY

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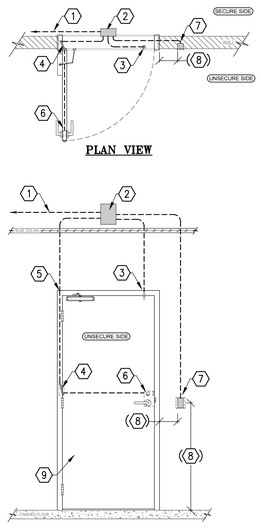
KEYED NOTES:

1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. CONCEALED DOOR POSITION SENSOR. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. POWER TRANSFER FOR WIRE ROUTING TO J-BOX. (BY DIV 08)
5. PROVIDE ¾"ø CONDUIT, REQUIRED FRAME, AND PATHWAY PREPARATION FOR WIREWAY THROUGH DOOR.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH. (BY DIV 08)
7. SINGLE GANG JUNCTION BOX AND ¾"ø CONDUIT FOR CARD READER. (BY DIV 26)
8. MOUNT CARD READER ON UNSECURE SIDE 42" AFF AND 6" OPTIMUM FROM DOOR.
9. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.



1 SINGLE ELEC. LOCK CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
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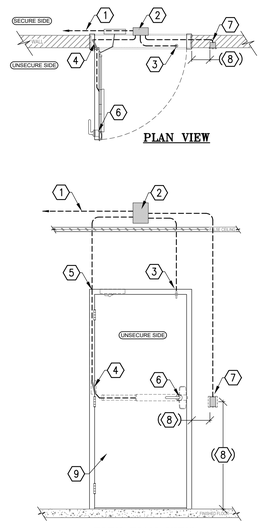
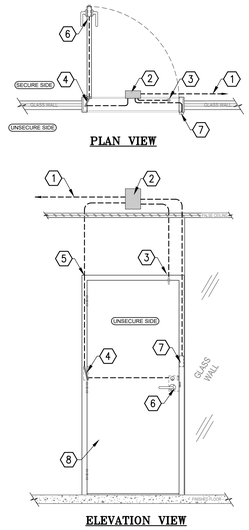
8. MOUNT CARD READER ON UNSECURE SIDE 42" AFF AND 6" OPTIMUM FROM DOOR.
9. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.



2 SINGLE EXIT DEVICE CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. DOOR MONITOR SWITCH. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. PROVIDE REQUIRED FRAME AND PATHWAY PREPARATION FOR FUTURE POWER TRANSFER WIREWAY THROUGH DOOR. (BY DIV 08)
5. PROVIDE ¾"ø CONDUIT, REQUIRED FRAME, AND PATHWAY PREPARATION FOR WIREWAY THROUGH DOOR.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH. (BY DIV 08)
7. RP15 CARD READER MOUNTED TO FRAME ON UNSECURE SIDE.
8. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.



3 SINGLE FRAME MOUNTED CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

1. ¾"ø CONDUIT TO ACCESSIBLE CEILING FOR PATHWAY AND WIRING TO SECURITY CONTROL LOCATION. (BY DIV 26)
2. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
3. CONCEALED DOOR POSITION SENSOR. PROVIDE ¾"ø CONDUIT AND REQUIRED FRAME AND PATHWAY PREPARATION.
4. POWER TRANSFER FOR WIRE ROUTING TO J-BOX. (BY DIV 08)
5. PROVIDE ¾"ø CONDUIT, REQUIRED FRAME, AND PATHWAY PREPARATION FOR WIREWAY THROUGH DOOR.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH. (BY DIV 08)
7. LATCH LOCKING HANDLE OR FIXED HANDLE ON INACTIVE DOOR LEAF. (BY DIV 08)
8. SINGLE GANG JUNCTION BOX AND ¾"ø CONDUIT FOR CARD READER. (BY DIV 26)
9. MOUNT CARD READER ON UNSECURE SIDE 42" AFF AND 6" OPTIMUM FROM DOOR.
10. COORDINATE WITH DIVISION 08 DOOR AND HARDWARE SPECIFICATIONS/DRAWINGS.

4 DOUBLE ELEC. LOCK CARD READER DOOR
SCALE: Not to Scale

5 NOT USED
SCALE: Not to Scale

6 NOT USED
SCALE: Not to Scale

7 NOT USED
SCALE: Not to Scale

8 NOT USED
SCALE: Not to Scale

9 NOT USED
SCALE: Not to Scale

Who: jjahn
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Where:D:\~datacom design group\Projects\jefferson county diversion center\datacom-security\SC.301.dwg
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08/23/2024	90% CONSTRUCTION DOCUMENTS
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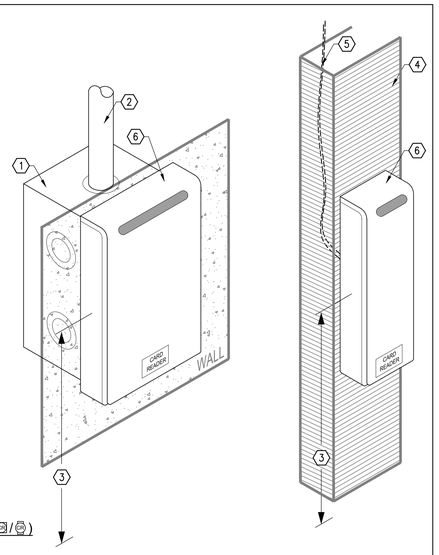
DOOR ELEVATION DETAILS - SECURITY

Scale: AS NOTED

SC.301

KEYED NOTES:

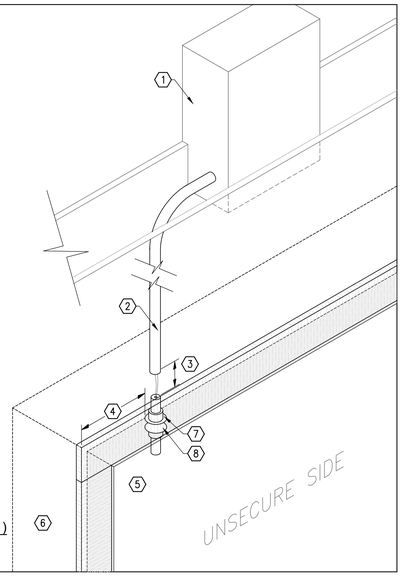
1. RECESSED SINGLE GANG BACK BOX.
2. ¾"ø CONDUIT C/W PULL STRING TO ACCESSIBLE CEILING SPACE. (BY DIV 26)
3. COORDINATE EXACT MOUNTING HEIGHT WITH ARCHITECT/GC.
4. DOOR MULLION.
5. COORDINATE WIRE ROUTING WITH DIV 08.
6. LABEL TOP OF CARD READER WITH CORRESPONDING DOOR DESIGNATION. COORDINATE WITH OWNER ON EXACT LABELING METHOD.



1 WALL & MULLION CARD READERS (/)
SCALE: Not to Scale

KEYED NOTES:

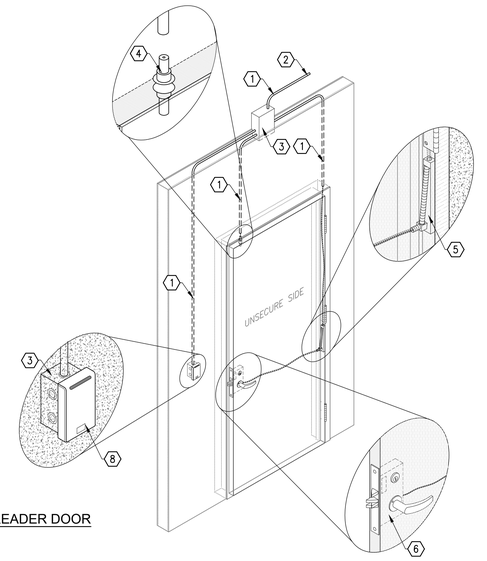
1. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX LOCATED NEAR DOOR ABOVE CEILING ACCESSIBLE TO SECURE SIDE. (BY DIV 26)
2. ¾"ø CONDUIT C/W PULL STRING. (BY DIV 26)
3. MAXIMUM OF 2" GAP WITH CLEAR WIRING PATH TO SWITCH.
4. 6" OPTIMAL FROM OUTSIDE EDGE OF HEADER.
5. DOOR. (BY DIV 08)
6. DOOR FRAME. (BY DIV 01 & 08)
7. DOOR POSITION SWITCH (1"ø) WITH DPDT CONTACTS. PROVIDE END OF LINE RESISTOR.
8. DOOR MOUNTED MAGNET (1"ø).



2 MONITORED DOOR POSITION SENSOR ()
SCALE: Not to Scale

KEYED NOTES:

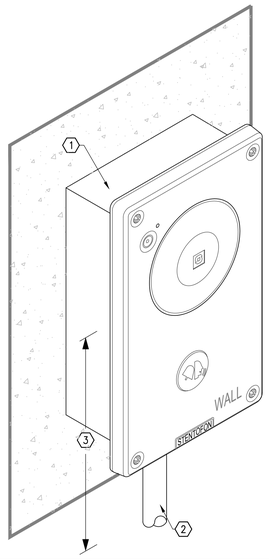
1. ¾"ø CONDUIT C/W POLYLINE PULL STRING.
2. TO SECURITY FIELD PANELS.
3. CONCEALED 6" X 8" X 4" COVERED JUNCTION BOX.
4. CONCEALED DOOR POSITION SENSOR. PROVIDE END OF LINE RESISTOR.
5. POWER TRANSFER.
6. ELECTRIFIED LOCKSET WITH INTEGRAL REX SWITCH.
7. RECESSED SINGLE GANG BACK BOX.
8. CARD READER.



3 TYPICAL INTERIOR CARD READER DOOR
SCALE: Not to Scale

KEYED NOTES:

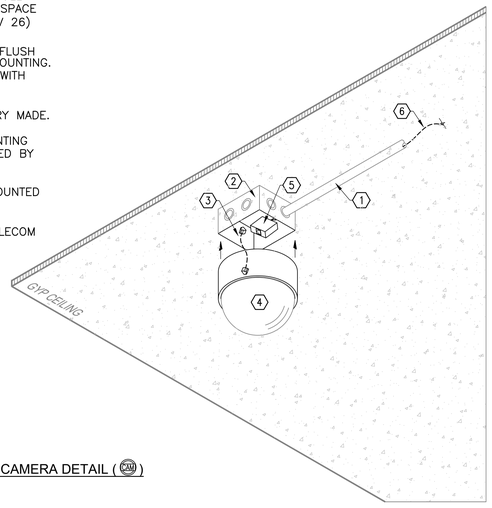
1. 5"W X 10½"H X 2½"D BOX.
2. ¾"ø CONDUIT C/W POLYLINE PULL STRING TO ACCESSIBLE CEILING SPACE FOR DATA CONNECTIVITY. (BY DIV 26)
3. COORDINATE EXACT MOUNTING HEIGHT WITH ARCHITECT/GC.



4 SURFACE MOUNTED INTERCOM STATION ( )
SCALE: Not to Scale

KEYED NOTES:

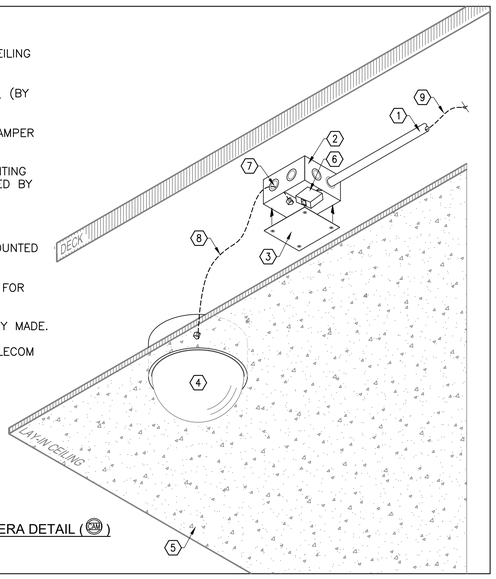
1. 1¼""ø CONDUIT C/W POLYLINE PULL STRING TO ACCESSIBLE CEILING SPACE FOR DATA CONNECTIVITY. (BY DIV 26)
2. 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" BOX MOUNTED FLUSH TO GYP CEILING FOR CAMERA MOUNTING. COORDINATE MOUNTING DETAILS WITH DIV 28. (BY DIV 26)
3. PATCH CABLES MUST BE FACTORY MADE.
4. CAMERA, ENCLOSURE, AND MOUNTING SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER.
5. BISCUIT WITH RJ-45 JACK UNMOUNTED IN BOX. (BY DIV 27)
6. HOMERUN BACK TO NEAREST TELECOM ROOM. (BY DIV 27)



5 GYP CEILING MOUNTED IP CAMERA DETAIL ( )
SCALE: Not to Scale

KEYED NOTES:

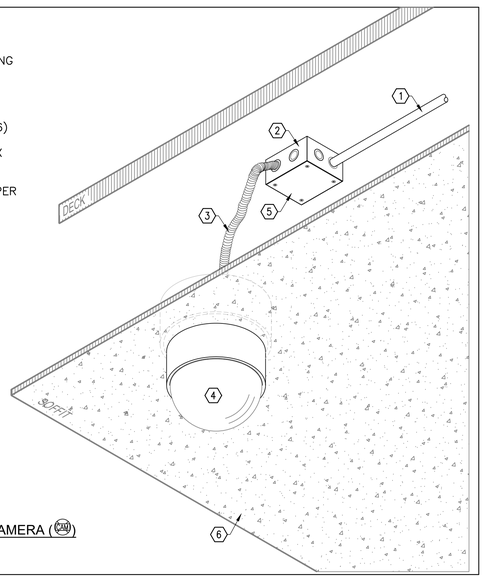
1. ¾"ø CONDUIT TO ACCESSIBLE CEILING OR CABLE TRAY. (BY DIV 26)
2. 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" TWO GANG BOX. (BY DIV 26)
3. BOX COVER PLATE WITH TORX TAMPER RESISTANT SCREWS.
4. CAMERA, ENCLOSURE, AND MOUNTING SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER.
5. SCHEDULED LAY-IN CEILING.
6. BISCUIT WITH RJ-45 JACK UNMOUNTED IN BOX. (BY DIV 27)
7. PROVIDE AND INSTALL GROMMET FOR KNOCK-OUT.
8. PATCH CABLES MUST BE FACTORY MADE.
9. HOMERUN BACK TO NEAREST TELECOM ROOM. (BY DIV 27)



6 CEILING MOUNTED IP CAMERA DETAIL ( )
SCALE: Not to Scale

KEYED NOTES:

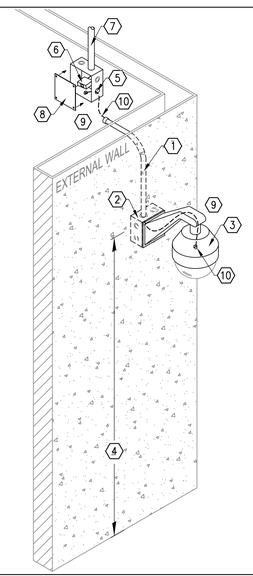
1. ¾"ø CONDUIT TO ACCESSIBLE CEILING OR CABLE TRAY. (BY DIV 26)
2. 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" BOX. (BY DIV 26)
3. ¾"ø FLEXIBLE CONDUIT. (BY DIV 26)
4. PROVIDE CAMERA, CAMERA BACKBOX AND MOUNTING HARDWARE.
5. BOX COVER PLATE WITH TORX TAMPER RESISTANT SCREWS.
6. SOFFIT.



7 EXTERIOR SOFFIT MOUNT CAMERA ( )
SCALE: Not to Scale

KEYED NOTES:

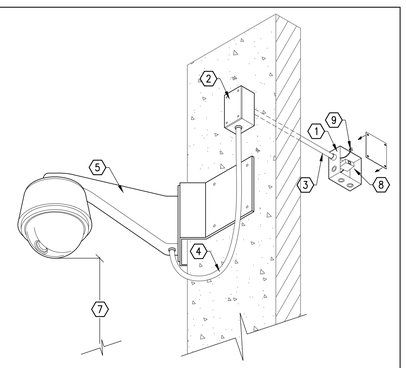
1. ¾"ø CONDUIT C/W POLYLINE PULL STRING FROM EXTERNAL BOX TO INTERNAL SPACE. (BY DIV 26)
2. FLUSH MOUNTED 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" DOUBLE GANG BOX. (BY DIV 26)
3. EXTERNAL PENDANT DOME CAMERA, ENCLOSURE AND MOUNTING SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER.
4. 10'-0" TO 11'-0" TYPICAL UNLESS OTHERWISE NOTED. FIELD VERIFY MOUNTING HEIGHT.
5. 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" DOUBLE GANG BOX. (BY DIV 26) PROVIDE AND INSTALL GROMMET FOR KNOCK-OUT.
6. BISCUIT WITH RJ-45 JACK UNMOUNTED IN BOX. (BY DIV 27)
7. ¾"ø CONDUIT TO CABLE TRAY OR ACCESSIBLE SPACE. (BY DIV 26)
8. BOX COVER PLATE WITH TORX TAMPER RESISTANT SCREWS.
9. PROVIDE AUXILIARY POWER FOR CAMERA SYSTEM AS REQUIRED.
10. PATCH CABLES MUST BE FACTORY MADE.



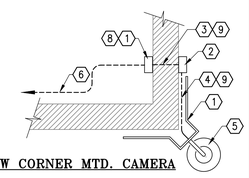
8 EXTERNAL WALL MOUNTED IP CAMERA ( )
SCALE: Not to Scale

KEYED NOTES:

1. SURFACE MOUNTED 4¹⁄₁₆"X4¹⁄₁₆"X2⅛" BOX. (BY DIV 26)
2. SURFACE MOUNTED SINGLE GANG EXTERIOR BOX. (BY DIV 26)
3. ¾"ø CONDUIT C/W POLYLINE PULL STRING TO BOX. (BY DIV 26)
4. ¾"ø EXTERIOR FLEXIBLE CONDUIT.
5. CAMERA, ENCLOSURE, AND MOUNTING SUPPORT HARDWARE AS REQUIRED BY THE MANUFACTURER.
6. CABLING TO NEAREST TELECOM ROOM. (BY DIV 27)
7. FIELD VERIFY MOUNTING HEIGHT.
8. BISCUIT WITH RJ-45 JACK UNMOUNTED IN BOX. (BY DIV 27)
9. FACTORY MADE PATCH CABLE.



ISOMETRIC



PLAN VIEW CORNER MTD. CAMERA

9 CAMERA CORNER MOUNTING
SCALE: Not to Scale

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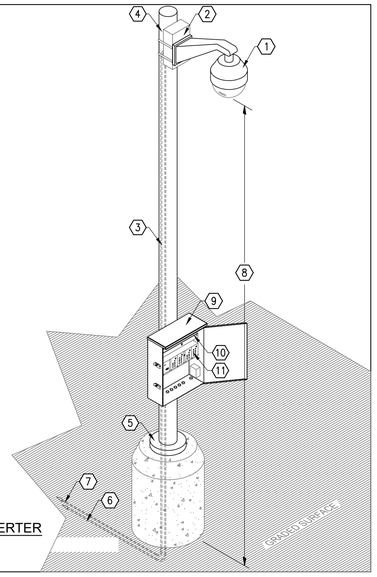
GENERAL DETAILS - SECURITY

Scale: AS NOTED

SC.401

KEYED NOTES:

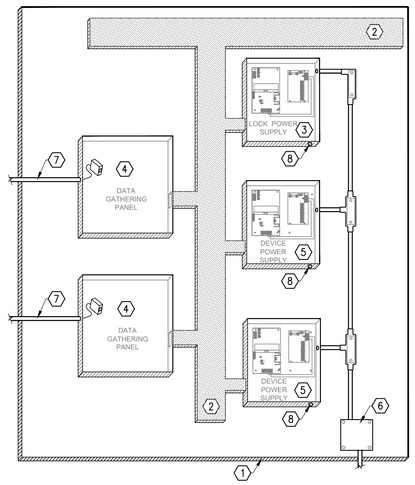
1. OUTDOOR RATED DOME CAMERA AND ASSEMBLY.
2. POLE MOUNT ADAPTER.
3. POWER AND DATA CABLE ROUTED IN SEPARATE CONDUIT OR RACEWAY THROUGH POLE AND CAMERA MOUNT.
4. LIGHT OR DESIGNATED CAMERA POLE. (BY DIV 26)
5. POLE BASE WITH GROUNDING ROD. (BY DIV 26)
6. CONDUIT FOR POWER ROUTED BELOW GRADE TO PULLBOX. (BY DIV 26)
7. 2"ø CONDUIT C/W POLYLINE PULL STRING FOR DATA SHALL BE ROUTED BELOW GRADE TO NEAREST PULLBOX. (BY DIV 26)
8. 15'–0" TO 20'–0" TYPICAL UNLESS OTHERWISE NOTED. FIELD VERIFY MOUNTING HEIGHT.
9. NEMA 4 BOX WITH LOCKABLE HINGED COVER (BY DIV 26).
10. FIBER OPTIC SPLICE CABINET.
11. FIBER OPTIC TO COPPER MEDIA CONVERTERS.



1 POLE MOUNTED CAMERA WITH MEDIA CONVERTER
SCALE: Not to Scale

KEYED NOTES:

1. ¾" FIRE RETARDANT PLYWOOD PAINTED FLAT WHITE. (COORDINATED BY GENERAL CONTRACTOR)
2. WIREWAY. (AS REQUIRED)
3. LOCK POWER SUPPLY WITH TAMPER SWITCH.
4. SECURITY DEVICE DATA GATHERING PANELS (DGP) WITH TAMPER SWITCH.
5. SECURITY DEVICE POWER SUPPLY WITH TAMPER SWITCH.
6. EACH PANEL REQUIRES A DEDICATED 120VAC CIRCUIT WITH DEDICATED GROUND ON 24 HOUR EMERGENCY POWER. (BY DIV 26)
7. EACH DGP REQUIRES ONE VOICE AND ONE DATA CIRCUIT. (BY DIV 27)
8. FIRE ALARM INTERFACE.



2 TYPICAL SECURITY WALL FIELD
SCALE: Not to Scale

3 NOT USED
SCALE: Not to Scale

4 NOT USED
SCALE: Not to Scale

5 NOT USED
SCALE: Not to Scale

6 NOT USED
SCALE: Not to Scale

7 NOT USED
SCALE: Not to Scale

8 NOT USED
SCALE: Not to Scale

9 NOT USED
SCALE: Not to Scale

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GENERAL DETAILS - SECURITY

Scale: AS NOTED

SC.402

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Who: gjahn
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