

April 18, 2019

ADDENDUM NO. 2

**#15036 – FORD FIELDS CONCESSION STAND
BEAUMONT, TEXAS**

The following changes, corrections and additions or deletions to the Drawings and Specifications are hereby made part of the Contract Documents. Bidders shall acknowledge receipt of this Addendum in the Bid Form

SPECIFICATIONS

GENERAL

1. Clarification – Owner provided signage shall not be illuminated.

SECTION 133419 – METAL BUILDING SYSTEMS

1. Metal Building Manufacturer may provide design and details for the Covered Canopy.
2. Structural Steel members exposed to the elements shall be galvanized, all other Steel shall be red oxide.

SECTION 323113 – CHAIN LINK FENCES AND GATES

1. Delete all references to Motor Operated Gates.
2. New fence height shall match existing height and profile.

SECTION 099123 – INTERIOR PAINTING

1. Clarification – Flooring in the Concession Stand. Please see Section 099123-Interior Painting Part 2 Section 2.8 Floor Coatings.

DIVISIONS 22 & 23

1. Delete all sections in Division 22 & 23 and replace with the attached new sections:

DIVISION 22 – PLUMBING

220500	GENERAL PROVISIONS FOR PLUMBING
220503	BASIC MATERIALS AND METHODS FOR PLUMBING
220700	PLUMBING INSULATION
221000	PLUMBING
221100	WATER SUPPLY
221300	WASTE WATER DISPOSAL
221600	NATURAL GAS PIPING/DISTRIBUTION



DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

230500	GENERAL PROVISIONS FOR HVAC
230503	BASIC MATERIALS AND METHODS FOR HVAC
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
230700	MECHANICAL INSULATION
230900	TEMPERATURE CONTROLS FOR HVAC
232813	COMMERCIAL KITCHEN HOODS
233000	AIR DISTRIBUTION FOR HVAC
237000	AIR CONDITIONING FOR HVAC

SECTION 232813 - COMMERCIAL KITCHEN HOODS

1. PART 2, 2.2 KITCHEN HOOD FAN PACKAGE, ITEM A: Add the following approved manufacturers: Captive-Aire and Loren Cook.
2. PART 2, 2.3 KITCHEN HOOD FAN PACKAGE , ITEM B. shall be disregarded. Back supply plenums are existing to be relocated by Contractor, not new.

SECTION 23 30 00 - AIR DISTRIBUTION

1. PART 2, 2.6 REGISTERS, GRILLES AND DIFFUSERS, ITEMS A & B: Add the following approved manufacturer: Metalaire.

DRAWINGS

Sheet A2.1

1. 3/A2.1 Delete Keyed Note 23 in its entirety. 18 Ga. Type 304L Stainless Steel wall panel shall cover all wall surfaces adjacent to cooking appliances on elevation. See SK-1attached.

Sheet A7.0

1. 2/A7.0 Delete Note 2 in its entirety, “EXPOSED FASTNER R PANELS SHALL BE USED FOR THIS PROJECT”. See metal roof panels as specified in 133419 – Metal Building Systems.

SHEET M3-3.0

1. Existing kitchen exhaust hoods, kitchen hood back supply plenums and ANSUL system to be relocated by the contractor from a location as directed by the owner, verify exact location with owner. The contractor shall be responsible for disconnection of the existing equipment, relocation and re-installation including disconnection and capping of any existing services to facilitate move. Existing equipment shall be re-installed in location per plans. Contractor shall furnish and install all new exhaust/makeup air ductwork and exhaust/makeup air fans per Sheet ME-3.0 and shall make connection to existing equipment including interlock of fan controls. Existing ANSUL system shall be reworked to accommodate new equipment layout under hood, revise piping, replace nozzles and rework panel as required for new installation.

End of Addendum No. 2



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SECTION 083313 - OVERHEAD COILING COUNTER DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead Coiling Counter Doors, manually operated.

1.2 RELATED SECTIONS

- A. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

1.3 REFERENCES

- A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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. Details of construction and fabrication.
 4. Details of weather stripping at jambs and sill.
 5. Installation methods.

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- C. Shop Drawings: Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.7 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.

1.8 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.9 WARRANTY

- A. Manufacturer's 5-year limited warranty for PowderGuard Weathered Powder Coat Finish applied to complete door system.

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PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corporation, 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
- B. Substitutions: As approved by Architect prior to bidding.
- C. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 OVERHEAD COILING STEEL COUNTER DOORS

- A. Galvanized Steel Counter Doors: Overhead Door Corporation, 650 Series.
 1. Wall Mounting Condition:
Face-of-wall mounting.
 2. Curtain: Interlocking slats, Type F-158 fabricated of 22 gauge galvanized steel. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.
 3. Finish:
Slats and hood galvanized steel in accordance with ASTM A 653 with rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester (powder coated) top coat.
Polyester Top Coat.
Gray polyester.
Powder coat: PowderGuard
PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.
Non-galvanized exposed ferrous surfaces for guides, bottom bar and head plates shall receive one coat of rust-inhibitive primer.
 4. Weather stripping is required at all jambs and sills.
 5. Bottom Bar:
Single primed steel angle bottom bar with weatherstrip.
Steel tubular locking bottom bar with weatherstrip.
 6. Guides: Extruded aluminum.
Finish: PowderGuard Weathered finish with iron/black powder.
Finish: PowderGuard Zinc Finish for guides, bottom bar and head plate.
 7. Brackets: Steel plate to support counterbalance, curtain and hood.
 8. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel.
 9. Hood: Provided with intermediate support brackets as required and fabricated of:
Galvanized primed steel.

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10. Operation:
Manual push up.
11. Locking:
Two point dead locks with mortise cylinder/s.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. 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 instructions.
- B. Install weather stripping at jambs and sill for a water tight installation.
- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- F. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.
- G. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- H. Install perimeter trim and closures.

3.4 ADJUSTING

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- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

250 Ridgeway Drive, Suite C-3
Lafayette, LA 70503
Phone: 337.984.8498



Ervin L. Ritter, P.E.* Andrea B. Manceaux**
Lee Ritter, C.I.E.

Fax: 337.984.8576

VIA EMAIL wjlechtenberg@lechtenbergconsulting.com

April 16, 2019

Wejee Lechtenberg
Lechtenberg Consulting P.O.
Box 6483
Lake Charles, LA 70606

RE: Ford Park
RCE Project No.: 190007

Dear Wejee:

Please include the following items in the next addendum to the project:

Item No.1: Contractor shall replace Specification Divisions 22 and 23 in their entirety with the attached.

Item No.2: Specification Section 23 28 13, PART 2, 2.3 KITCHEN HOOD, Item B. shall be disregarded. Back supply plenums are existing to be relocated by Contractor, not new.

Item No.3: Sheet ME-3.0. Existing kitchen exhaust hoods, kitchen hood back supply plenums and ANSUL system to be relocated by the contractor from a location as directed by the owner, verify exact location with owner. The contractor shall be responsible for disconnection of the existing equipment, relocation and re-installation including disconnection and capping of any existing services to facilitate move. Existing equipment shall be re-installed in location per plans. Contractor shall furnish and install all new exhaust/makeup air ductwork and exhaust/makeup air fans per Sheet ME-3.0 and shall make connection to existing equipment including interlock of fan controls. Existing ANSUL system shall be reworked to accommodate new equipment

layout under hood, revise piping, replace nozzles and rework panel as required for new installation.

*Licensed in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Texas, and Virginia

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**Licensed in Louisiana, Texas, Mississippi, North Carolina and Connecticut

Ford Park Addendum

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Item No.4: The following manufacturers are approved for bidding. Manufacturer's listed are approved in name only and approval does not waive any requirements of the plans and specifications. Shop drawings will be required for final review and approval of specific items under consideration.

<u>Equipment</u>	<u>Manufacturer</u>
Grilles, Diffusers, Registers	Metalaire
Hood Fans and Accessories	Captive-Aire

If you have any questions, please do not hesitate to call.

Sincerely,



Andrea B. Manceaux

ABM/abm

attachments

2019-04-16 ADD Ford Park 190007.docx

CERTIFICATION OF RESPONSIBILITY FOR

DOCUMENT PREPARATION

FORD PARK-FORD FIELDS CONCESSION STAND
RCE Project No.: 190007

MECHANICAL SPECIFICATIONS

THE FOLLOWING SPECIFICATION SECTIONS INCLUDED IN THIS PROJECT MANUAL
WERE PREPARED BY OR UNDER THE RESPONSIBLE SUPERVISION OF THE COMPANY
LISTED BELOW:

22 05 00	GENERAL PROVISIONS FOR PLUMBING
22 05 03	BASIC MATERIALS AND METHODS FOR PLUMBING
22 07 00	PLUMBING INSULATION
22 10 00	PLUMBING
22 11 00	WATER SUPPLY
22 13 00	WASTE WATER DISPOSAL
22 16 00	NATURAL GAS PIPING/DISTRIBUTION



A handwritten signature in blue ink that appears to read "Andrea Manceaux".

3/15/19

Andrea Manceaux, P.E.
Ritter Consulting Engineers Ltd.

FORD FIELDS CONCESSION STAND BEAUMONT,
TEXAS

SECTION 22 05 00 - GENERAL PROVISIONS FOR PLUMBING

PART 1 - GENERAL

1.1 DIVISION OF SPECIFICATIONS

- A. For Bidder's convenience only, this Division of the Specifications is divided into the following parts:

22 05 00	GENERAL PROVISIONS FOR PLUMBING
22 05 03	BASIC MATERIALS AND METHODS FOR PLUMBING
22 07 00	PLUMBING INSULATION
22 10 00	PLUMBING
22 11 00	WATER SUPPLY
22 13 00	WASTE WATER DISPOSAL 22
16 00	GAS DISTRIBUTION

1.2 GENERAL CONDITIONS

- A. The General Conditions of the Architectural Specifications along with supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein. The contractor shall review Architectural General Conditions. Where the requirements of Architectural General Conditions and these specs conflict for the contractor, the most stringent shall be applied.
- B. Plumbing subcontractor shall be the sole source responsible party to furnish and install the plumbing system. Plumbing contractor shall be properly licensed to perform this work.
- C. Wherever the word contractor is mentioned in Division 22 of these specifications, it is intended to mean the Plumbing Contractor as appropriate. These are sub contractors to the General Contractor who has the contract with the owner. It is the General contractor who bears the responsibility to fulfill this part of the project (Division 22 – Plumbing) under the contract with the owner. The General Contractor shall be responsible for all costs associated with any and all bidding errors and omissions of the sub-contractor.

1.3 SCOPE OF WORK

- A. Furnish labor, materials and equipment necessary to provide and install the complete plumbing portion of this contract, as called for herein and on accompanying drawings. Parts of the plumbing division may be bid separately or in combination at the contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the Plumbing Division have been included if he chooses to accept separate bids.

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GENERAL PROVISIONS FOR PLUMBING

22 05 00 - 1/14

B. Contractor shall refer to the Architectural, Structural, Mechanical and Electrical drawings and install all equipment, piping, etc., to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in space provided or coordinated with other trades involved on the project.

C. It is the intention of these Specifications that all plumbing systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc., necessary to provide a satisfactory installation in working order and in accordance with all Federal, State, and local codes and ordinances.

D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the contractor from the responsibility of installing his work to meet conditions.

E. Lack of coordination shall not be acceptable and shall not be a reason for poorly installed work or additional cost to this trade or others on the project. All associated extra cost shall be borne by the contractor. The General Contractor shall be responsible for all costs, time, and liquidated damages associated with lack of coordination or poor coordination.

1.4 LOCAL CONDITIONS

A. Location and elevation of all services is based on information obtained from the Owner. However, this shall serve as a general guide only and the contractor shall visit the site and verify the location and elevation of this service to his own satisfaction in order to determine the amount of work required for the execution of the contract.

B. Contractor shall contact the various utility companies, determine the extent of their requirements and cooperate with the utility company in reaching a finished product. Contractor shall pay charges by Utility Company for extensions, connections, meter fees, street patching, etc.

C. In case major changes are required, this fact, together with the reasons therefore, shall be submitted to the Architect, in writing, not less than 7 days before the date of bidding. Failure to comply with this requirement will make the contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.5 CUTTING AND PATCHING

A. Initial cutting and patching shall be the responsibility of the General Contractor with the Plumbing Contractor responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimbled without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this contractor's expense.

B. Cutting and patching shall be done in such a manner that the surrounding work will be restored to its original condition.

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C. The plumbing piping shall be run at proper slopes and without conflicts with other trades. It may be necessary to penetrate beams, grade beams, footings, and foundations. Install thimbles as required and as approved by the Structural Engineer and Architect.

1.6 CODES AND STANDARDS

A. The entire plumbing work shall comply with the rules and regulations of the City, County and State in which this project is being constructed including the State Fire Marshal and State Board of Health. All modifications required by these authorities shall be made without additional charge to the Owners. The Plumbing Contractor shall report these changes to the Architect and secure his approval before work is started.

B. In addition to the codes mentioned, all plumbing work and equipment shall conform to the applicable portions of the following Specifications, codes and regulations:

1. National Electric Code
2. National Fire Protection Association
3. American Society of Mechanical Engineers
4. Underwriters's Laboratories
5. American Gas Association
6. Energy Code for Commercial and High Rise Residential Buildings
7. International Energy Conservation Code
8. International Building Code
9. International Plumbing Code

C. Materials, equipment and accessories installed under this contract shall conform to all rules, codes, etc., as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. Materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, contractor shall submit a sample for approval before proceeding.

D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories whether or not called for in these Specifications.

E. Unfired pressure vessels shall be built in accordance with the ASME Code and so stamped. Furnish shop certificates for each vessel.

F. Material and equipment furnished or installed as part of these construction documents shall be installed and operated in strict accordance with the respective manufacturer's guidelines for installation and operating instructions. The manufacturer's guidelines shall become part of the construction documents.

1.7 MINOR DEVIATIONS

A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may

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require certain modifications from the manner of installation shown and such deviations are permissible and shall be made as required, but, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift pipes or to change the shape of and these changes shall be made as required. All such changes shall be referred to the Architect/Engineer for approval before proceeding. Extra charges shall not be allowed for these changes.

- B. No structural beams or joists (concrete or steel) shall be cut or thimbled without first receiving the approval of the Architect/Structural Engineer. After initial surfacing has been done, any further cutting, patching and painting shall be done at the Plumbing Contractor's own expense.
- C. Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project without drawing on the contractor's experience or ingenuity. However, only typical details are shown on the plans. In cases where the contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details shall not be an excuse for improper installation. Submit installation shop drawings with manufacturer's details for review prior to installation.
- D. In general, the drawings are diagrammatic and the contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect/Engineer is to state which equipment, piping, etc., is to be relocated regardless of which item was first installed.

1.8 WORKMANSHIP

- A. Workmanship shall be of highest grade, highest quality and all construction shall be done according to the best practice of the trade. Work shall be completed to satisfaction of the Architect/Engineer.

1.9 COORDINATION

- A. Coordinate work of the different trades to avoid interferences between plumbing and all other work. All piping, ductwork, etc., shall be installed in lines as required to accomplish this end whether or not shown on the plans.
- B. There will be a certain amount of work which must be coordinated with the Owner. This contractor shall coordinate required work with the Owner through the General Contractor using procedures acceptable to the Architect and Owner. The contractor shall maintain documentation of coordinated work.
- C. This contractor shall coordinate and confirm that all equipment requiring electric service will be adequately and properly serviced by Electrical Contractor. Any conflicts shall be brought to the attention of the Architect/Engineer prior to ordering the equipment.
- D. This contractor shall coordinate the space clearances required for the sprinkler system with the structure, ceilings, lights, ductwork, etc. In some cases, due to space limitations, it may be necessary to reroute piping to meet the conditions of the project. Any rerouting required

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shall be part of this project and done without any additional cost to the Owner. **DO NOT
MAKE PIPING WITHOUT COORDINATION. Avoid conflicts with other trades.**

- E. This contractor shall coordinate the installation of sewer lines with all parts of the structural foundation system and structural building systems. Provide sleeves through graded beams or concrete beams at all conflicts. All points of penetration of foundation shall be reviewed by the Architect/Engineer prior to rough-in. All sleeves shall be installed per the instructions and details of structural engineer.
- F. All piping shall be run as high as possible with sleeves through concrete beams to avoid conflicts. This means the piping shall run in or through the structure unless approved otherwise by the Architect/Engineer.

1.10 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these requests for acceptance of products must be received by the Architect a minimum of 10 days prior to bid date. Submission shall include manufacturer's name, model number, rating table and construction features. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. The contractor shall base his bid solely on those items specified or included in the "Prior Approval Addendum" as no other item will be acceptable. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the contractor of the responsibility of assuring himself that this equipment is in complete accord with plans and Specifications and will fit into the space provided. Submit shop drawings on all items of equipment for approval as hereinafter specified.
- B. Should a substitution or variation occur, the better quality or greater quantity of material or work shall be furnished. This also does not preclude other manufacturers if they meet the following criteria:
 1. Product proposed for substitution shall be equal or superior to that specified in construction, efficiency, utility and function.
 2. Physical size of substitute brand shall not be greater than space provided for it.
 3. Profile of substitution shall be same concerning size, shape, indentations, recesses, etc.
 4. Complete illustrations, specifications and description of substitution shall be submitted for approval.
 5. Availability and proximity of manufacturer's service representative shall be factors considered in substitution approval.
 6. Substitution and/or variations shall be reviewed and allowed when there is no change in cost to the project and shall be made at the discretion of the Engineer.

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1.11 SHOP DRAWINGS

- A. The General Contractor shall submit all submittals within 30 days of the date of the contract between owner and contractor or the date of notice to proceed as issued by the Owner to the General Contractor. The submittals shall have been submitted to the General Contractor within 30 days after the construction contract has been signed. The General Contractor and his sub-contractors shall bear all responsibility for any extra costs or delays to late submittals of shop drawings.
- B. Drawings shall be presented in a clear and thorough manner.
- C. Details shall be identified by reference to sheet detail, schedule or room numbers shown on contract and drawings.
- D. Drawings shall contain the following information:
 - 1. Date.
 - 2. Number of the drawing or revision.
 - 3. Name of project or facility.
 - 4. Name of contractor and subcontractor.
 - 5. Clear identification of contents and location of work.
- E. Preparation:
 - 1. Clearly mark each copy to identify pertinent products or models.
 - 2. Show performance characteristics and capacities.
 - 3. Show dimensions and clearances required.
 - 4. Show wiring or piping diagrams and controls.
 - 5. Show weights and mounting data.
 - 6. Provide letter documentation confirming that all coordination with other trades effected have been done. This is especially necessary with the electrical requirements and rough-in requirements.
- F. Manufacturer's standard schematic drawings and diagrams:
 - 1. Modify drawings and diagrams to delete information which is not applicable to the work.
 - 2. Supplement standard information to provide information specifically applicable to the work.
- G. Office samples shall be of sufficient size and quantity to clearly illustrate:
 - 1. Functional characteristics of the product, with integral related parts and attachment devices.
 - 2. Full range of color, texture and pattern.
- H. Equipment shop drawing shall be prepared by the contractor/supplier. These shop drawing shall include the manufacturer's performance data and installation manuals. In addition, the shop drawings shall show the installation specific to this project.

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- I. Assemble certificates, executed by each of the respective manufacturers, suppliers, and subcontractors.
- J. All submittals shall be submitted prepaid and in ample time for review before installation.
- K. Six (6) copies of each submittal shall be submitted to the Architect.
- L. These shop drawings shall be supplied as part of this contractor's contract. Any drawings not approved shall be resubmitted until approved. Submit all shop drawings at the same time. No separate items will be accepted.
- M. Time necessary for review of samples, certificates, test reports, and shop drawings is at least 30 calendar days after receipt of the item. All materials installed in the work shall match the reviewed submittals. After a submission has been reviewed, no substitutions will be permitted without written approval by the Architect.
- N. The Architect's/Engineer's review of shop drawings shall not relieve the contractor from the responsibility of incorrectly figured dimensions or any other errors that may be contained in these drawings. The omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the contractor from furnishing and erecting same.
- O. Any delays caused by contractor not submitting shop drawings within a timely manner shall be the problem of the responsible subcontractor and the General Contractor.

1.12 UTILITIES

- A. Connect all utilities at the points indicated on the drawings and extend such utilities to the building and to equipment or facilities requiring same.
- B. Contractor shall pay all service and connection charges required by utility companies and/or site conditions (offsets, conflict boxes, etc.).
- C. Contractor shall include all costs required by utility companies to extend utilities to the site. It is the responsibility of the contractor to obtain these fees from the utility companies and include those costs in the bid.

1.13 REPAIRING ROADWAYS AND WALKS

- A. Where this contractor cuts or breaks roadways or walks to lay the piping, he shall repair or replace these sections to meet the Architect's approval. Repair of public roadways and highways shall be done per the Federal, State or Local agencies having jurisdiction. Contractor shall obtain and pay for all permits.

1.14 EXCAVATION AND BACK FILL

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- A. Trench and excavation work shall include excavating, preparing of trenches, and backfilling as specified. Contractor shall install caution tape 12 inches above all piping, conduit, etc., as backfilling processes.
- B. Trench and excavation work shall not include pavement breaking, cutting of holes through foundation walls and floors, removal of obstructions, relaying and/or repairing of floors, and repaving, which work shall be the responsibility of the General Contractor.
- C. Contractor shall do all necessary trenching, excavation and backfilling for the proper installation of his work. Care shall be taken not to excavate below depth required, that trench beds are well rounded and that ground under pipe line is firm and secure before any pipe is laid. Trenches shall be excavated where bells of pipe occur in order to insure a pipe resting on the entire length of the bottom of the trench.
- D. Unless otherwise noted, minimum cover over underground lines shall be 2-1/2 feet, except under streets and parking lots where minimum cover shall be 3 feet.
- E. The width of the trench shall be sufficient to permit thorough compaction of the backfill under and around the pipe but not exceeding the external diameter of the pipe by more than 12 inches. Excavation for pipes shall be by hand and/or machine and as specified herein and shall confirm to the lines and elevations indicated on the plans.
- F. The pipe shall be placed on a uniformly firm and compacted bed of sand, carefully shaped to support the pipe at the desired grade and so that any reaction will be distributed as nearly uniform as possible over a horizontal width of not less than sixtenths (6/10) of the outside diameter and all possibility of concentration of the reaction at or near the vertical diameter eliminated. The bed shall be shaped as to fit the lower part of the pipe exterior for at least 10 percent of its overall height.
- G. The pipe shall be placed on a firm foundation. Any muck or other objectionable material found during excavation and preparation of the bed shall be removed and replaced with suitable bed material directed by the Architect.
- H. All trenches and excavation shall be backfilled in a reasonable time after the pipes are installed unless otherwise directed by the Architect. Special care shall be taken in placing the backfill and extra care shall be used to obtain compaction under and along sides to the top of the pipe.
- I. The backfill shall be placed in loose layers not exceeding 6 inches in depth under and around the pipe and not exceeding 8 inches over the pipe. Each layer shall be compacted to the compaction requirements as specified by the Architect.
- J. Compaction shall be by hand and pneumatic tampers and the successive layers shall be added and compacted until the trench is completely filled and brought to elevation as directed. Back-filling shall be done in such a manner as to avoid injurious top or side pressures on the pipe.
- K. Improper backfilling and compacting shall be cause to have the trench opened to expose the pipe for inspection then properly backfilled and compacted with fill material.

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L. Where trenching is for piping, the bottom of the trench shall have minimum 95 percent compaction and shall be bedded with a minimum 12 inches compacted sand, crushed stone or shell on undisturbed soil (minimum 95 percent compaction).

1.15 MATERIALS

A. Work materials shall be new and the best of their respective kinds, and shall bear the label of NFPA, ASME Code, AGA, and UL where such standard has been established for the particular item of equipment used.

1.16 MATERIAL STORAGE

A. General: Provide space for storage of material and equipment at ground level. Roof surfaces shall not be used for storage of materials or equipment. Any storage within the building shall be approved by the Architect prior to use of the space.

B. Exterior: Pipe, fitting, or other materials stored outside of building shall be set on wood or steel racks or platforms inside storage container units. All necessary provisions shall be made to keep water and debris away from such stored material. Ends of pipes and valves shall be kept sealed until used.

C. Warehousing: Equipment subject to rusting shall be kept warehoused until just prior to setting. If necessary the warehouse shall have climate controlled conditions.

D. Offsite warehousing shall be approved by the Architect and Owner only.

E. Any warehousing used shall be approved by the Owner and an insurance certificate naming the Owner as insured shall be provided to the Owner.

1.17 GROUNDS AND CHASES

A. Contractor shall see that all required chases, sleeves, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise he shall bear the cost of providing them.

1.18 SPECIAL TOOLS

A. Special tools required for proper operation or maintenance of any equipment provided under this contract shall be delivered to the Owner at the completion of the project.

1.19 FILL AND CHARGES FOR EQUIPMENT

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- A. Fill and charge with materials or chemicals all devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.
- B. This contractor shall flush systems as required per local and state jurisdictions and equipment/material manufacturer's guideline. (Chlorination, chemical treatment, etc.)

1.20 EQUIPMENT ACCESS

- A. Large equipment to be installed in building, which is too large to permit access through doorways, shall be brought to the job by the contractor and placed before enclosing structure. Equipment shall be cribbed up from the floor by the contractor and covered where necessary or directed.

1.21 EQUIPMENT IDENTIFICATION

- A. Stenciling: All items of major plumbing equipment (water heaters, pumps, starters, mixing valves, etc.) shall be neatly and clearly stenciled in letters not less than 1 inch high, with the same designation as appears on drawing. Location and color of such stenciling shall be appropriate for ready identification and/or as directed by the Architect. One set of compatible metal interlocking stencil letters and numbers shall be turned over to the Owner at the completion of the job. At contractor's option engraved plastic adhesive tags may be used. Tags used outdoors shall be listed for such use.
- B. Pipe Coding: All piping, etc., both insulated and bare, shall be color coded with a general purpose pipe marker for interior locations and a 6 inch enamel painted ban for exterior locations, and stenciled as to service and characteristics on the 10 foot centers and/or as directed. Directional arrows not less than 1/2 inch wide and not less than 6 inches long shall be permanently stenciled on each line at each stencil location. Stenciling shall be located such that it is clearly visible from floor or adjacent service platform. Coding shall be as per schedule approved by Owner through submittal to Architect. At contractor's option, pre-manufactured vinyl pipe labels and directional arrows may be used but shall be banded on either end to secure to pipe.
- C. Valve tags shall be installed on all valves controlling building zones, areas, or equipment. Valve tags shall be 2 inch diameter brass stenciled with valve number. A framed list of valves with associated numbers, sizes and locations shall be mounted in the building as directed by Architect.

1.22 TEMPORARY USE OF EQUIPMENT

- A. The permanent equipment installation shall not be used for temporary purposes by the contractor for temporary conditioning of the building during construction.

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B. Acceptable Use Without Specific Authorization: Temporary use shall not be construed to mean "bumping" of electric motors on equipment to verify rotation direction nor short time operation of systems for test purposes.

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1.23 CLEANING AND ADJUSTING

A. Upon completion of his work, the contractor shall clean and adjust all equipment, controls, valves, etc. Clean all piping, etc., and leave entire installation in good working order.

1.24 PAINTING

A. This contractor shall obtain the services of a painting sub-contractor as part of his contract with the General Contractor for all painting.

B. General: Except for standard factory finishes, all pipe, pipe covering, equipment, supports, hangers, etc., exposed inside and outside building or in equipment room shall be painted. This contractor shall prepare surface of material to receive first coat of paint. All subsequent coatings shall be prepared by Painting Subcontractor. Requirements covering paints, workmanship and preparation of surfaces as stated in Architectural Specifications shall govern. Color coding shall be approved by Architect (submit color samples). All submittals for review shall be through Architect.

C. Damage: Where standard equipment factory finishes have been damaged or scratched, the damaged area shall be repaired or replaced by the contractor to match the original finish.

D. Preparation: Thoroughly clean surfaces of all rust, scale, cement, and dirt from all equipment, piping or other work installed and leave ready for finish painting.

E. All exposed piping shall be painted. Paint with two (2) coats of paint. The color shall be industry standard color coding. Submit color code chart with sample color chips to Architect for review prior to starting work.

1.25 FIRESTOPPING

A. Penetrations through rated construction shall be sealed with a material capable of preventing the passage of flames and hot gases when tested in accordance with ASTMEB14.

B. Notify Architect for inspection of all completed fire and/or smoke barrier walls before any construction is installed that may conceal the firestopping material installation.

C. Access to random selected areas may be required by the architect at the time of final inspection should notification not be given.

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D. Provide detailed instructive cutsheets of fire penetration sealing system (firestopping) used to the architect at the time of inspection. Random selective sampling by the contractor will be observed by the architect and State Fire Marshal.

GENERAL PROVISIONS FOR PLUMBING

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1.26 NOISE VIBRATION

A. General: Take the utmost precautions in the installation of the equipment, piping, and duct systems to prevent noise and vibration transmission. Noise levels determined by octave band analysis with all components of the mechanical system operating and the building completely furnished shall not exceed NC-35 in operations and office areas, and shall not exceed NC-45 in equipment areas. Where equipment and installations do not meet these limits, the contractor must provide necessary attenuation to reduce net noise levels to the above requirements.

B. Isolation of equipment: Equipment that would tend to cause noise or vibration shall be isolated to prevent noise transmission to the building or to other equipment.

C. Equipment Connections: Piping, conduit, or other connections to equipment shall be isolated. The contractor shall be responsible for the prevention of noise and vibration transmission through these connections to equipment.

1.27 PERMITS, INSPECTIONS AND TESTS

A. Contractor shall obtain and pay for permits, fees, etc., for the installation, inspection, service connections, verifying location or construction of the work which are required by any authority and/or agencies having jurisdiction.

B. Contractor shall arrange and pay for inspections, examinations and tests required to obtain complete and final acceptance of all plumbing systems. Contractor shall deliver certificates of all such inspections to the Architect.

C. Contractor shall notify Architect and local governing authorities before any tests are made and tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In the event defects are found, these shall be corrected and the work shall be retested.

D. Prior to requesting final inspection by the Architect, the contractor shall have a complete coordination and adjustment meeting of all of his subcontractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing 10 days prior to this meeting instructing him of the time, date and whom you are requesting be present. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

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1.28 TRAINING OF MAINTENANCE PERSONNEL

- A. Contractor shall provide on the job training for Owner's personnel upon completion of the work including testing and adjustment. Minimum 20 hours of onsite training shall include maintenance checks, lubrication of components, adjustment of control set points, and troubleshooting techniques.

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B. Contractor shall use factory start-up personnel to train the Owner's maintenance personnel.

1.29 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Provide Owner with four (4) copies of printed instructions indicating various pieces of equipment by name and model number complete with parts lists and maintenance and repair instructions. This information shall be bound in plastic covered notebooks. Submit the manuals to the Architect for approval.
- B. Include all warranty certificates or statements in a separate section of the manuals. Provide all materials and test certificates for the final inspections.
- C. Provide three (3) sets of DVDs of the operation and maintenance manuals.

1.30 GUARANTEE

- A. Contractor shall guarantee all materials, equipment and workmanship for a period of one year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc., necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters.
- B. If the contractor's office is in excess of a 50 mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

1.31 WARRANTIES

- A. Assemble warranties executed by each of the respective manufacturers, suppliers, and subcontractors into a warranty book and prepare a table of contents.
- B. Two (2) original signed copies of each warranty are required.
- C. Provide complete information for each item including:
 1. Product and work item.
 2. Local supplying firm or manufacturer's dealer, with name of principal, address and telephone number.
 3. Scope of warranty.
 4. Date of beginning of warranty.
 5. Duration of warranty.
 6. Provide information for Owner:

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- a. Proper procedure to evoke the warranty in case of failure.
- b. Instances which might affect the validity of the warranty.
- c. Contractor, name of responsible principal, address and telephone number.
- d. All contractors and manufacturers equipment warranties shall start at the acceptance of the project by the Owner.
- e. Provide owner with contact information for warranties which extend beyond one year.

1.32 RECORD DRAWINGS

- A. Contractor shall maintain two (2) sets of drawings of the original construction documents to utilize as markup sets to record field modifications from original construction documents. Once approval has been gained from the Architect, the contractor shall record these variances on the two (2) sets in a neat and readable manner. Noted shall be sizes, locations, changes in directions, etc. with distances dimensioned from columns, walls, inverts, etc. The maintenance and cost of these documents shall be the responsibility of the contractor.

1.33 DEMOLITION

- A. This contractor shall do all demolition as shown on the plans. The contractor shall make the areas ready for the new construction work. All demolition debris, piping, equipment, etc., shall be removed from the site by this contractor. All demolition work shall be scheduled through the General Contractor to prevent interruption of any existing services. Do not start any demolition which would interrupt the building operation without scheduling with the Owner (schedule through the General Contractor).
- B. The Owner shall retain first salvage rights to anything within the demolition area. If the Owner selected an item to be retained, then this contractor shall remove it with care and deliver the item to the Owner designated location on site. Anything not retained by the Owner shall become the property of the contractor and be removed from the site.

1.34 MATERIALS CONTAINING HAZARDOUS SUBSTANCES OR COMPONENTS

- A. This contractor shall not provide any material or component of equipment which contains asbestos, lead based paint or PCBs. The contractor shall provide certificates or manufacturer's statements/letters to show that the products and/or building materials do not contain asbestos, lead based paint or PCBs.
- B. If any product or building material is found to contain asbestos, lead based paint or PCBs, the contractor shall bear all cost for removal, abatement, and disposal of materials in accordance with all state and federal regulations. The contractor shall install replacement materials to the satisfaction of the Architect at no additional cost to the project.

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C. During the construction, if the contractor suspects that any material in the building contains or is a hazard material (asbestos, lead, PCB, mercury, etc.) work shall be stopped to prevent disturbance and the Owner shall be notified immediately.

END OF SECTION 22 05 00

SECTION 22 05 03 - BASIC MATERIALS AND METHODS FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Type of piping for various systems shall be as specified herein.
B. All pipe shall be true and straight without sags or traps.

PART 2 - MATERIALS

2.1 SANITARY SEWER WASTE AND VENT LINES

A. All great waste piping (interior and exterior) shall be constructed of service weight bell and spigot cast iron pipe and fittings. Where space requirements do not allow the use of the above materials, government type DWV copper pipe shall be used. All cast iron pipes shall comply with Commercial Standards CS 188-59 coated with tar inside and out and marked with manufacturer's identification and proper weight classification. Joints shall be made with neoprene gaskets.
B. All sanitary sewer waste and vent lines **excluding grease waste piping** shall be Schedule 40 PVC pipe and fittings with solvent weld joints (solid core allowed only; foam or cell core not acceptable). Grease waste piping shall remain cast iron.

2.2 DOMESTIC WATER PIPE/WATER HEATER RELIEF PIPE/EQUIPMENT DRAIN PIPE/TRAP PRIMER

A. All domestic cold water lines/hot water lines within building, water heater relief lines and equipment drain piping shall be government type "L" hard copper water tube of standard weight and thickness, unless indicated otherwise. Use 95-5 "lead free" solder on all piping above slab. Use Silfos 1000 degrees Fahrenheit solder on all piping beneath slabs. "Press-Fit" or "Pro-Press" piping is not acceptable.
B. Site water piping (beyond 5 feet of building footprint) shall be Schedule 40 PVC pipe and fittings solvent weld joints (solid core allowed only; foam or cell core not acceptable).

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2.3 PIPE FITTINGS

- A. All pipe fittings shall be same as piping specified unless indicated otherwise.
- B. Fittings for domestic water lines shall be solder type wrought copper, Nibco or equivalent.

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2.4 PIPE SPECIALTIES

A. Dielectric unions shall be used between copper and iron pipe.

2.5 PIPE HANGERS AND SUPPORTS

- A. This contractor shall furnish and install all foundations and supports required for his equipment unless indicated otherwise on the drawings.
- B. This contractor shall furnish and install all escutcheons, inserts, thimbles, hangers, etc., required for the proper support and installation of his equipment and piping. Cooperate with other trades in locating and placing these items.
- C. Provide sleeves for all pipes passing through walls, floors, beams, etc. Sleeves passing through structural members shall be of cast iron or Schedule 40 steel pipe unless other material is approved by the Structural Engineer. Sleeves passing through nonstructural walls or floors shall be of Schedule 10 galvanized iron. Joints between sleeves and pipes passing through floors shall be made watertight with plastic materials. Where pipes pass through floors shall be made watertight with plastic materials. Where pipes pass through waterproofing membrane, flashing sleeves shall be installed.
- D. Provide malleable iron split ring hangers with rod supports throughout. Strap hangers or wire will not be accepted. Maximum spacing of hangers for cast iron pipes shall be 5 feet; for other than soil, use 10 feet.
- E. Provide galvanized iron shields between hangers and pipe covering.
- F. Provide chrome plated brass escutcheons wherever pipes pass through floors, walls or ceilings in exposed or finished areas.
- G. All piping projecting from chases shall be rigidly supported in the wall or chase. Loosely supported piping or accessories will not be accepted.

2.6 VALVES AND UNIONS

- A. Furnish and install all valves, unions, stops, connections, etc., shown on plans and necessary to make a complete system in working order. Provide valves on inlet and outlet of all equipment and fixtures and on branch lines to fixtures or groups of fixtures.
- B. Valves and unions shall be as follows:

COPPER PIPE 2" AND LESS MV OVER 2" MV

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Gate Valve Crane 1320 115 Crane 461 M-2882 Globe Valve Crane 1310 1590T Crane
359 F-2981 Unions Crane 633 Crane Std. Gal.
Check Valve Crane 1303 1509 Crane 373 2974M

<u>IRON PIPE</u>	<u>2" AND LESS</u>	<u>MV</u>	<u>OVER 2"</u>	<u>MV</u>
Gate Valve Crane 440 148	Crane 461 F2882-M	Globe Valve Crane 7 590	Crane 359	Crane 359
F Unions Crane 633				
Check Valve	Crane 1303	1509	Crane 373	2974M

C. The following valves are considered equal to Crane Company:

<u>CRANE</u>	<u>POWELL</u>	<u>NIBCO</u>	<u>HAMMOND</u>	<u>STOCKHAM</u>	<u>MV</u>
7	150	T-235-Y	1B413T	B-22	590T
359	301	F-718-Y	1R126	G514	F2981
373	559	F918B	1R1124	G931	M2974
440	500	T113	1B640	B114	148
461	1787	F619	1R1138	G612	M-2882
	1303	1825	S413(BWY) 1B943	B309	1509
	1310	1823	S211(YW) 424	B14	1502
1320	1822	S113	1B647	B112	115

D. All valves, unions, etc., where pipe is chrome plated shall have similar finish. All exposed supplies to plumbing fixtures shall be chrome plated.

E. Ball valves shall be as manufactured by Milwaukee Valve (MV), Watts, Stockham, Powell, NIBCO, Neles-Jamesbury or Hammond.

	<u>2" and Smaller</u>	<u>2-1/2 to 4"</u>	<u>Over 4"</u>
Watts	Series B-6800	Series G-4000	Series G-4000
Neles-Jamesbury	Series 4000	Full Port Series	Full Port Series
Milwaukee Valve	BA-300	F-20CS	F-20CS

F. All valves over 2 inches shall be flanged type and full port type. All valves 2 inches and smaller shall be screw type, sweat type or flanged type as appropriate for type of pipe.

2.7 MOTORS STARTERS AND ELECTRICAL WORK

A. The Plumbing Contractor shall furnish to Electrical Contractor for installation, all motor starters, start-stop push buttons and pilot lights for each piece of motor driven equipment unless shown otherwise.

B. The Electrical Contractor shall install all motor starters, start-stop push buttons and pilot lights as furnished by the Plumbing Contractor. The Electrical Contractor shall do all power wiring required for the installation of all equipment including equipment interlocking power wiring, etc. All work shall be done in accordance with the National Electrical Code

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requirements and with wiring workmanship, etc., as called for in the Electrical Specifications. The Plumbing Contractor shall provide approved wiring diagrams of all equipment, controls, etc., to the Electrical Contractor for his installation. Coordinate all work to provide a complete system in working order. All wiring shall be plenum rated.

- C. All electrical equipment shall have UL label or ETL label and shall meet the standards of the National Electrical Code and NEMA.
- D. Plumbing contractor shall provide and install transformers and low voltage wiring (below 120-1-60) from transformer to equipment. Electrical contractor shall provide and install power wiring to transformers.

2.8 ACCESS PANELS

- A. Furnish and install access panels where valves, dampers, etc., are concealed in walls, ceilings, floors or otherwise inaccessible. Panels shall be Milcor Babcock, Larsen, MIFAB, Acudor, Nystrom or equivalent. All access panels shall be minimum 18 inches X 18 inches hinged with flush latch and lock. The panels shall be constructed of minimum 18 gauge stainless steel. Frame flange shall be minimum 1-1/2 inches wide. Rated panels shall have U.L. rating for type wall or ceiling where located.
- B. Access panels located in rated walls, floors, ceilings, shall be so rated and installed per manufacturer's recommendations to maintain rated integrity.

PART 3 - EXECUTION

3.1 SANITARY SEWER PIPE

- A. Pipe ends shall be square cut. Ends of pipes shall be reamed and shall be wiped clean to remove cuttings. Before installation, pipe shall be stood on end and tapped sharply to remove cuttings and other foreign materials from interior. Pipe shall be thoroughly cleaned inside and outside. Bending or springing of pipe shall not be permitted.
- B. Various service pipes, valves, fittings, etc., running parallel with each other and near together shall be in line with each other and shall be kept at a sufficient distance from each other and other work to permit no less than 1/2 inch between finished coverings on different services.
- C. Each contractor shall furnish all foundations, structural or pipe supports indicated, called for specifically or that may be required to support his particular equipment and material unless hangers are definitely indicated as being furnished by others. Sewer waste and vent lines shall be supported every 4 feet.

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- D. Perforated strap hangers shall not be allowed for any part of the hangers.
- E. Drainage and vent pipes: Horizontal soil and waste pipes 3 inches and smaller shall have a grade of 1/4 inch per foot and line 4 inches and larger shall have a grade of 1/8 inch per foot unless otherwise specified. The main vertical soil and waste vent shall be extended full size through the wall. Cast-iron pipe inside the building shall be extended 6 inches above the floor.
- F. Fittings: Changes in pipe size on soil, waste, and drain lines shall be made with reducing fittings of recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, or 1/16 bends, or by a combination of those or equivalent fitting, except that single and double sanitary tees may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweeps not less than 3 inches in diameter may be used where the change in direction of flow is either from horizontal to vertical or from vertical to horizontal.
- G. Pipe sleeve, hangers, and fixture supports: These items shall be furnished and set and the contractor shall be responsible for their proper and permanent location.
 - 1. Pipe sleeves - Install sleeves for all pipes passing through footings, floors, and walls. Clearance between sleeves and pipe covering and/or pipes shall be approximately 1/4 inch. Construction shall not be cut except where approved by the Architect. Where cutting of construction is permitted, the construction shall be repaired to match its original condition. Sleeves shall not be installed in structural members except where indicated. Sleeves are not required for wall hydrants.
 - a. Install sleeves for pipes that pass through walls. Sleeves that pass through walls shall be cut flush with surfaces. The space between sleeves and pipe or covering shall be sealed with graphite packing and synthetic rubber caulking compound.
 - b. Install sleeves where pipes pass through waterproofing membrane. The sleeves shall be provided with an integral flashing flange or a clamping device to which a 4 pound lead flashing shield shall be clamped or soldered. The shield shall extend 12 inches from the pipe and shall be thoroughly mopped into the membrane. The space between the sleeve and pipe shall be made watertight by inserting an oakum gasket, filling the remaining space with lead, and thoroughly caulking.
 - 2. Threaded pipe - Support pipes at 4 foot intervals.
 - 3. Copper tubing - Support tubing at not more than 5 foot intervals. Hangers for copper tubing except where protective shields are installed shall have proper size rings to suit outside diameter of tubing and the hangers or supports shall be copper or copper plated at contact surfaces.
 - 4. Underground piping - Lay pipe on a firm bed for its entire length, except where support is otherwise provided.
 - 5. Vertical piping - Supports shall be at each floor. Horizontal piping - Hangers and

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supports shall be installed at locations not more than 3 feet from the end of each run out. A hanger shall be installed not over 1 foot from each change in direction of piping.

- H. Make connections to equipment and branch mains with unions.
- I. Provide drain valves at main shutoff valves, low points of piping and apparatus.
- J. Install each fixture with trap, easily removable for servicing and cleaning. Each trap shall be placed as near the fixture as possible, and no fixture shall be double trapped. At completion thoroughly clean plumbing fixtures and equipment.
- K. Fixture connections: Connections between earthenware fixtures and flanges on soil pipes shall be made absolutely gas tight and water tight with a closet-setting compound or gasket. Bolts shall be not less than 1/4 inch in diameter and shall be equipped with chromium-plated nuts and washers.
- L. Test sanitary drainage, condensate drains and vent systems with water or air in accordance with requirements of the State Sanitary Code, International Plumbing Code and all applicable local codes. Water test may be applied to entire drainage systems or sections of systems. All openings shall be tightly closed in section to be tested except at highest opening. All portions of systems shall be subject to a minimum of 10 feet head of water. Water must have been in the system two hours prior to inspection. Air test in accordance with the Plumbing Code may be used at contractor's option.
- M. Sanitary sewer or storm drain pipe penetrating concrete slabs shall be wrapped with foam insulation tape.

3.2 DOMESTIC WATER PIPE

- A. Perforated strap hangers shall not be allowed for any part of the hangers.
- B. Mains, branches, and run outs: Piping shall be installed as indicated on the drawings. Pipe shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Above ground piping shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipes from service lines may be taken from top, bottom, side or main, using such crossover fittings as may be required by structural or installation conditions. Service pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not 1/2 inch between finished covering on the different services. No water pipe shall be made with reducing fittings. Use of long screws and bushings will not be permitted. Slope water pipe 1 inch in 40 feet and arrange to drain at low point.

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- C. Expansion and contraction of piping: Allowance for expansion and contraction shall be made throughout. Sufficient flexibility shall be provided on all branch run outs from mains to risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that the piping will spring enough to allow for expansion without straining.
- D. Joints: Tubing shall be cut square, and butts shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendation. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a noncorrosive paste flux and solid string of wire solder. Cored solder will not be permitted.
- E. Valves: Valves shall be provided on all supplies to fixtures as specified under type of fixture and fixture trimmings. Valves indicated in connection with run outs, risers, branches, and mains shall be in accordance with this specification. No valve shall be installed on any lines with its stem below the horizontal. All valves shall be gate valves unless otherwise specified or indicated. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- F. Pipe sleeve, hangers, and fixture supports: These items shall be furnished and set and the contractor shall be responsible for their proper and permanent location.
 - 1. Pipe sleeves - Install sleeves for all pipes passing through footings, floors, and walls. Clearance between sleeves and pipe covering and/or pipes shall be approximately 1/4 inch. Construction shall not be cut except where approved by the Architect. Where cutting of construction is permitted, the construction shall be repaired to match its original condition. Sleeves shall not be installed in structural members except where indicated. Sleeves are not required for wall hydrants.
 - a. Install sleeves for pipes that pass through walls. Sleeves that pass through walls shall be cut flush with surfaces. The space between sleeves and pipe or covering shall be sealed with graphite packing and synthetic rubber caulking compound.
 - b. Install sleeves where pipes pass through waterproofing membrane. The sleeves shall be provided with an integral flashing flange or a clamping device to which a 4 pound lead flashing shield shall be clamped or soldered. The shield shall extend 12 inches from the pipe and shall be thoroughly mopped into the membrane. The space between the sleeve and pipe shall be made watertight by inserting an oakum gasket, filling the remaining space with lead, and thoroughly caulking.
 - 2. Threaded pipe - Support pipes at 4 foot intervals.
 - 3. Copper tubing - Support tubing at not more than 5 foot intervals. Hangers for copper tubing except where protective shields are installed shall have proper size rings to suit outside diameter of tubing and the hangers or supports shall be copper or copper plated at contact surfaces.
 - 4. Underground piping - Lay pipe on a firm bed for its entire length, except where support is otherwise provided.

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5. Vertical piping - Supports shall be at each floor. Horizontal piping - Hangers and supports shall be installed at locations not more than 3 feet from the end of each run out. A hanger shall be installed not over 1 foot from each change in direction of piping.
- G. Unions: Make connections to equipment and branch mains with unions. Provide nonconducting type connections wherever jointing dissimilar metals in open systems. Brass adapters and valves are acceptable.
- H. Domestic cold water lines penetrating concrete slabs shall be wrapped with vinyl flexible tube. Domestic hot or return water piping penetrating concrete slabs shall be insulated at all penetrations through slab (refer to insulation specifications).
- I. Provide drain valves at main shutoff valves, low points of piping and apparatus.
- J. Hydrostatically test entire domestic water system to 200 psig or 2-1/2 times normal working pressure.
- K. Cleaning and Disinfectant: Domestic water piping system shall be cleaned and disinfected. All equipment, temporary piping and chemicals, as required shall be furnished by the contractor. All system piping and equipment shall be thoroughly and completely flushed with cold domestic water. Completely drain the systems and fill with a solution of Sodium or Calcium Hypochlorite, 100 parts per million, completely relieving the system of all air. Allow the solution to stand for eight hours and then drain and follow with clear water flush for a sufficient period of time to remove all traces of hypochlorite odor. Disinfecting chemicals shall not be introduced into existing piping systems.
- L. Sealing or flashing the building envelope due to penetrations in building shall be the responsibility of the general contractor.
- M. Water service to fixtures or groups of fixtures shall have 12 inch long air chambers at the same diameter as header or service pipe on both hot and cold water lines. Air chamber shall be installed close to fixture. Provide and install shock arrestors on sterilizer water supplies or supplies with quick closing valves such as flush valves, dishwashers, tempering valves, etc. Location and size of shock arrestor shall be as per manufacturer's instructions.

END OF SECTION 22 05 03

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SECTION 22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Pipe insulation installation shall not begin until all work has been tested and found to be tight. All insulation shall be UL listed and have a flame spread of less than 25 and a developed smoke rating less than 50. All insulation shall be banded with aluminum bands, three per section. All insulation shall be continuous through walls, floors, ceilings, etc.

PART 2 - MATERIALS

2.1 DOMESTIC WATER PIPING

- A. Cover cold water lines above ceilings and in exterior walls with 1 inch thick and all hot water lines with 1-1/2 inch thick closed cell rubber type insulation. At contractor's option, fiberglass insulation with white universal jacket may be used. All flanges, valves and fittings shall be insulated with closed cell rubber type molded fittings insulation, fabricated mitered segments of pipe insulation or closed cell rubber type insulation equivalent in thickness to insulation of adjoining pipe.
- B. All water lines exposed in mechanical rooms shall be covered with 0.020 color coded PVC jacket with solvent welded seams and joints.
- C. All water lines outside of building exposed to the weather shall have 1 inch thick closed cell rubber type insulation covered with 0.016 smooth aluminum jacket and elbows.
- D. All water lines below building slab shall be insulated with 1 inch thick closed cell insulation with two (2) coats of mastic.

2.2 HORIZONTAL WASTE PIPING

A. All horizontal waste lines and traps above first floor slab which receive condensate from air conditioning equipment, shall be insulated with 2 inch thick, 3/4 pound density fiberglass insulation with aluminum foil vapor barrier or closed cell rubber insulation.

2.3 INSULATION BANDS

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A. All pipe insulation shall be banded with nylon tie-wrap bands, three to a section, and with one band on each side of each fitting, valve, etc.

PLUMBING INSULATION

22 07 00 - 1/2

2.4 FLANGES, VALVES AND FITTINGS

A. All flanges, valves and fittings shall be insulated with fabricated fiberglass molded fitting insulation, using factory fabricated fittings up to 3 inches and fabricated mitered segments of pipe insulation equal in thickness to the insulation to the adjoining pipe. All fabricated mitered segments shall be covered with matching embossed vapor barrier laminate.

PART 3 - INSTALLATION

3.1 Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.

A. Insulation Installation:

1. Do not install covering before piping has been tested and approved.
2. Ensure piping surface is clean and dry prior to installation.
3. Ensure insulation is dry before and during application.
4. Insulation shall be continuous through walls, floors and ceiling. Pack around pipes with fire proof self-supporting insulation material, fully sealed.
5. Insulate fittings and valves. The end of the insulation shall be fitted with a metal escutcheon plate with set screw or taped neatly with pressure sensitive fiberglass reinforcing cloth.
6. All joints shall be sealed with 3 inch wide fiberglass reinforcing cloth with pressure sensitive adhesive.
7. Pipe insulation at Hangers and Supports: Pipe insulation at hanger and support shall be protected with a half circular shield of the size of the insulation and 12 inches long constructed from 20 gauge galvanized steel. The shield shall be held in place with the fiberglass reinforcing cloth and pressure sensitive adhesive. Where pipes pass through walls, ceiling and floor in finished areas, escutcheon plates shall be installed to encompass pipe and insulation. Escutcheon plates shall be chromed brass or stainless steel and shall be either solid or the clamp on split type.
8. Painting of fiberglass pipe jacket is not required. Piping shall be painted colors as standard in this facility.

END OF SECTION 22 07 00

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PLUMBING INSULATION

22 07 00 - 2/2

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SECTION 22 10 00 - PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor and materials as hereinbefore specified, indicated or reasonably implied for the complete installation of the following systems:

1. Cold Water
2. Hot Water System
3. Sanitary Drainage System

PART 2 - MATERIALS

2.1 FLOOR DRAINS

- A. All floor drains shall be constructed of cast iron and shall be complete with clamping devices as required.
- B. Floor drains (Marked "FD"): shall be bottom outlet with duracoated cast iron body with clamping collar and 6 inch diameter nickel bronze strainer adjustable vertically to floor level, with square perforations and vandal proof screws. Refer to fixture schedule for specific types.

2.2 CLEANOUTS

A. Cleanouts shall be provided where shown on plans, at each change of direction of the building drain greater than 45 degrees and at or near the foot of each vertical waste or soil stack. Location of all cleanouts shall be same size as piping up to 4 inches. Larger pipes shall have 4 inch cleanouts unless noted otherwise. Every cleanout shall be installed so that the cleanout opens in the direction of flow of the drainage line or at right angles thereto. Floor cleanouts shall be adjustable type, double drainage flange, clamping collar (above ground installations), 2 pound lead flashing, nickel bronze cover. Top of cleanout shall be level with top of finished floor so there is a continuous surface. Floor cleanouts shall be Jay R. Smith, Josam or Wade. Wall cleanouts shall be nickel bronze access frame and cover Zurn, Jay R. Smith, Josam or Wade. Outside cleanouts shall be installed with cover, set flush with finished grade, or as detailed on plans.

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2.3 FLASHING

A. Flash around all pipes passing through roof in connection with this contract with sheet lead, not less than 2-1/2 pound to the square foot, built 6 inches into the waterproofing, running 10 inches up the pipe and turned over into the pipe cavity. Flashing around roof drains shall be not less than 2-1/2 pound lead extending at least 12 inches from the drain rim into membrane waterproofing. Fasten flashing to drain clamp device making watertight durable joint.

2.4 EQUIPMENT FURNISHED BY OWNER AND/OR BY OTHER TRADES

- A. This equipment and other miscellaneous equipment shall be furnished and set in place under other sections of these Specifications and/or by the Owner, unless specified otherwise.
- B. Plumbing Contractor shall provide necessary rough-in required for the equipment and shall completely connect all plumbing services for this equipment providing cut-off valves and unions for each plumbing supply service to each piece of equipment. It is the obligation of the Plumbing Contractor to obtain correct rough-in dimension plans for this equipment as well as the equipment furnished under this contractor.
- C. The various Equipment Contractors shall provide access holes for service lines that enter his equipment. This work to be performed on the job site, as necessary. Plumbing Contractor shall furnish and install escutcheons, locknut type, at these locations.

2.5 PLUMBING FIXTURES

- A. Plumbing Contractor shall furnish and install all plumbing fixtures shown on accompanying drawings. Refer to both plumbing and architectural drawings and provide all fixtures shown on either. Fixtures shall be complete with all necessary brass and accessories required for a complete installation including traps, escutcheons, angle supplies, basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated in perfect condition.
- B. All brass must be of the best quality, lightweight goods will not be accepted. All brass pipe shall be seamless brass tubing and nipples shall be extra heavy. All fittings and trim shall be chromium plated heavy brass unless otherwise specified. "P" traps shall be cast brass with cleanouts. All exposed piping shall be chromium plated. Provide cutoff valves at each fixture in both hot and cold water piping.
- C. For the purpose of establishing type and class of fixtures required, the scheduled plate numbers have been taken from the indicated catalog. Approved equals shall be as follows: Fixtures: Kohler, Briggs, American Standard, Crane, Eljer, Elkay, Dayton, Just or Universal Rundle. Flush Valves: Sloan, Zurn. Faucets: Elkay, Just, Chicago, Kohler, American Standard, Delta Commercial, Zurn, Speakman. Water Heaters: A.O. Smith, Ruud/Rheem,

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State, Bradford White. Drains: Wade, J.R. Smith, Zurn, Josam. Hose Bibbs: Josam, Woodford, J.R. Smith, Wade, Zurn.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of adjacent trades and verify that all such work is complete to the point where fixture installation may properly commence.
2. Verify that all hangers and fixture supports are properly installed to receive plumbing fixtures.

3.2 PLUMBING FIXTURE

- A. Each plumbing fixture shall be fitted with all necessary and proper fittings, trimmings and operating devices, and shall be in perfect operating condition.
- B. Refer to architectural drawings for any other information that may be necessary or required in connection with plumbing installation.
- C. Before setting any fixtures, obtain the exact mounting height, as desired, from the Architect.
- D. Wall mounted water closets, urinals, and lavatories shall have a floor anchored carrier to fit in available wall space (coordinate requirements in drawings).

END OF SECTION 22 10 00

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SECTION 22 11 00 - WATER SUPPLY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Install water supply piping as indicated on plans.

PART 2 - MATERIALS

2.1 PIPING

- A. All water supply piping shall be of materials hereinbefore specified.
- B. All water lines shall be disinfected in accordance with the State Sanitary Code.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water lines run underground shall have a minimum of 24 inches cover to finished grade.
- B. Make up complete water supply system. Connect to all fixtures and outlets requiring water.
- C. At each fixture or group of fixtures furnish and install a 12 inch high air chamber of same size as branch feed line except at fixtures with quick closing valves such as flush valves, dishwashers, etc., in which cases provide "Shock Arrester" properly sized for each unit.

3.2 TESTING

- A. All lines shall be tested in accordance with requirements listed in construction documents and International Plumbing Code.

END OF SECTION 22 11 00

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WATER SUPPLY

22 11 00 -
1/1

SECTION 22 13 00 - WASTE WATER DISPOSAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Extend sanitary sewer lines to the location as shown on the plans.

PART 2 - MATERIALS

2.1 PIPING

- A. The system of sewage and drainage shall be of materials as hereinbefore specified except where space requirements necessitate the use of Type "DWV" copper.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All work shall be in strict conformity with the International Plumbing Code and in accordance with all local codes. Piping shall be routed as shown on plans or in acceptable manner to meet building conditions. Venting shall be as shown on plumbing riser diagrams.
- B. Connections between traps and cast iron pipes are to be made with heavy brass ferrules.
- C. Provide reducers, increasers, special flanges, and fittings where required between piping work and fixtures in order to connect and complete work and render it ready for use. Make any offsets required to avoid construction.
- D. All lines 3 inches and smaller shall be sloped 1/4 inch per foot, lines 4 inches shall be sloped 1/8 inch per foot, lines 6 inches shall be sloped 1/16 inch per foot and all lines 8 inches and larger shall be sloped 0.4 percent. Piping shall be laid so slope is continuous.
- E. All vents shall extend 10 inches above roof and terminate in an appropriate flashing collar. No vents shall penetrate roof within 48 inches of an exterior wall. Offset in ceiling as required. All back vents shall be taken off as near trap as possible.

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WASTE WATER DISPOSAL

22 13 00 - 1/2

3.2 TESTING

- A. All lines shall be tested in accordance with requirements listed in construction documents and International Plumbing Code.

END OF SECTION 22 13 00

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WASTE WATER DISPOSAL

22 13 00 - 2/2

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SECTION 22 16 00 – NATURAL GAS PIPING/DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Fuel gas systems, including piping, equipment and all necessary accessories as designated in this section. Fuel gas piping to equipment shall be routed as shown on plans.

1.2 RELATED WORK

- A. FIRESTOPPING: Penetrations in rated enclosures.
- B. PAINTING: Preparation and finish painting and identification of piping systems.
- C. COMMON WORK RESULTS FOR PLUMBING.
- D. GENERAL DUTY VALVES FOR PLUMBING PIPING

1.3 SUBMITTALS

- A. Submit SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Pipe & Fittings.
 - 2. Valves.
 - 3. Strainers.
 - 4. All items listed in Part 2 - Products.
- C. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Use the edition listed or most recent edition adopted by Local, State or Federal agencies having jurisdiction.

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B. Federal Specifications (Fed. Spec.):

A-A-59617 Unions, Brass or Bronze Threaded, Pipe
Connections and Solder-Joint Tube Connections

C. American National Standards Institute (ANSI):

American Society of Mechanical Engineers (ASME): (Copyrighted Society)

A13.1-(2007) Scheme for Identification of Piping Systems B16.3-
(2006) Malleable Iron Threaded Fittings: Classes 150 and
300 ANSI/ASME

B16.9-2007 Factory-Made Wrought Steel Butt-welding Fittings
ANSI/ASME

B16.11-2009 Forged Steel Fittings, Socket-Welding and
Threaded ANSI/ASME

B16.15-2006 Cast Copper Alloy Threaded Fittings: Classes 125
and 250 ANSI/ASME

B31.8-2010 Gas Transmission and Distribution Piping Systems
ANSI/ASME

D. American Society for Testing and Materials (ASTM):

A47-99(2009) Standard Specification for Ferritic Malleable Iron
Castings

A53-10 Standard Specification for Pipe, Steel, Black And
Hot-Dipped, Zinc-coated Welded and Seamless

A183-09 Standard Specification for Carbon Steel Track
Bolts and Nuts

A536-09 Standard Specification for Ductile Iron Castings

A733-03(2009)e1 Standard Specification for Welded and Seamless
Carbon Steel and Austenitic Stainless Steel Pipe
Nipples

B687-99(2005)e1 Standard Specification for Brass, Copper, and
Chromium-Plated Pipe Nipples

E. National Fire Protection Association (NFPA):

54-2009 National Fuel Gas Code

F. International Code Council

IPC 2009 International Plumbing Code IFGC

2009 International Fuel Gas Code

G. International Association of Plumbing and Mechanical Officials (IAPMO):

Uniform Plumbing Code – 2009

IS6-06 Installation Standard

H. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):

SP-72-2010 Ball Valves with Flanged or Butt-Welding For
General Service

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SP-110-2010 Ball Valve Threaded, Socket-Welding, Solder Joint,
Grooved and Flared Ends

1.5 SYSTEM PRESSURE

A. Natural gas systems, unless otherwise noted are designed and materials and equipment selected to prevent failure under gas pressure at downstream side of pressure regulator.

PART 2 - MATERIALS

2.1 FUEL GAS SERVICE CONNECTIONS TO BUILDING (UNDERGROUND AND/OR EXPOSED TO WEATHER)

A. From inside face of exterior wall (outside of building), use coated piping as herein before and/or herein after specified.

B. Pipe: Black Steel, ASTM A53, Schedule 40. Shop-applied pipe coating shall be one of the following types:

1. Coal Tar Enamel Coating: Exterior of pipe and fittings shall be cleaned, primed with Type B primer and coated with hot-applied coal tar enamel with bonded layer of felt wrap in accordance with AWWA C203. **Asbestos felt shall not be used**; felt material shall be fibrous glass mat as specified in Appendix Section A2.1 of AWWA C203.
2. Adhesive-thermoplastic Resin Coating: Fed. Spec. L-C-530, Type I
3. Thermosetting Epoxy Coating: Fed. Spec. L-C-530, Type II
4. Field-applied plastic tape material used on pipe joints and for repairing damaged areas of shop-applied coatings, Fed. Spec. L-T-1512, Type I, 10 mils nominal thickness for pipe joints, and Type II, 20 mils nominal thickness for coating repairs.

C. Holiday Inspections: Procedure for holiday inspection: Holiday Inspection shall be conducted on all coatings to determine the presence and number of discontinuities in those coatings referenced in 2.6/B - 1, 2, 3, and 4 using a Tinker & Rasor model AP/W Holiday Detector. Holiday inspection shall be performed in a manner spelled out in the Tinker & Rasor operating instructions and at a voltage level recommended by the coating manufacturer or applicable NACE International Standard such as RPO 274-93 or RPO 490-90 in the case thermosetting epoxy coating. Holiday Detectors shall be calibrated and supplied with a certificate of calibration from the factory. A calibration of the Holiday Detector shall be performed once every 6 months to verify output voltages are true and correct.

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D. Fittings:

1. Butt weld fittings, wrought steel, ANSI B16.9.
2. Socket weld and threaded fittings forged steel, ANSI B16.11.
3. Grooved End: Ductile iron (ASTM A536, Grade 65-45-12), malleable iron (ASTM A47, Grade 32510), or steel (ASTM A53, Type F or Type E or S, Grade B).

E. Joints: Welded, ANSI B31.8.

2.2. FUEL GAS PIPING

A. Pipe: Black steel, ASTM A53, Schedule 40.

B. Nipples: Steel, ASTM A733, Schedule 40.

C. Fittings:

1. Sizes 2 inches under ANSI B 16.3 threaded malleable iron.
2. Over 2 inches and up to 4 inches ANSI B16.11 socket welded.
3. Over 4 inches ANSI 16.9 butt welded.

D. Joints: Provide welded or threaded joints.

2.3 EXPOSED FUEL GAS PIPING

A. Finished Room: Use full iron pipe size chrome plated brass piping for exposed fuel gas piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.

1. Pipe: Fed. Spec. WW-P-351, standard weight
2. Fittings: ANSI B16.15 cast bronze threaded fittings with chrome finish, (125 and 250).
3. Nipples: ASTM B 687, Chromium-plated.
4. Unions: 2 inches and smaller MSS SP-72, SP-110, Brass or Bronze threaded with chrome finish. Unions 2-1/2 inches and larger shall be flange type with approved gaskets.
5. Valves: MSS SP-72, SP-110, Brass or bronze with chrome finish.

B. Unfinished Rooms, Mechanical Rooms and Kitchens: Chrome-plated brass piping is not required. Paint piping systems as specified in Section PAINTING.

2.4 VALVES

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- A. Ball Valve: Bronze body, rated for 1025 kPa at 185°C (150 psi at 365°F), 1725 kPa at 121°C (250 psi at 250°F), reinforced TFE seat, stem seal and thrust washer; end entry, threaded ends, UL-listed for natural or LP gas shut off service when used on those services.
- B. Gas Vent Cocks: Type 701: Bronze body, tee handle, rated for 205 kPa at 38°C (30 psi at 100°F), ground plug, rated for tight shut-off on fuel gas service.

2.5. WATERPROOFING

- A. Provide at points where pipes pass through membrane waterproofed floors or walls in contact with earth.
- B. Floors: Provide cast iron stack sleeve with flashing device and a underdeck clamp. After stack is passed through sleeve, provide a waterproofed caulked joint at top hub.
- C. Walls: See detail shown on drawings.

2.6 STRAINERS

- A. Provide on high pressure side of pressure reducing valves, on inlet side of indicating and control instruments and equipment subject to sediment damage and where shown on drawings. Strainer element shall be removable without disconnection of piping.
- B. Gas Lines: "Y" type with removable mesh lined brass strainer sleeve.
- C. Body: Smaller than 3 inches, brass or bronze; 3 inches and larger, cast iron or semi-steel.

2.7 DIELECTRIC FITTINGS

- A. Provide dielectric couplings or unions between ferrous and non-ferrous pipe.

2.8 GAS EQUIPMENT CONNECTORS

- A. Flexible connectors with teflon core, interlocked galvanized steel protective casing, AGA certified design.

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2.9 REGULATORS

- A. Provide all pressure regulators for the project. Contractor shall be responsible for providing regulators properly selected for pressure, flow, and location. All regulators shall be field adjustable. All regulators shall be vented type. Regulators installed inside buildings shall have vent piping extended to the exterior of the building.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with the International Fuel Gas Code and the following:

1. Install branch piping for fuel gas and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, shall be reamed to full size after cutting.
3. All pipe runs shall be laid out to avoid interference with other work.
4. Install valves with stem in horizontal position whenever possible. All valves shall be easily accessible.
5. Install union and shut-off valve on pressure piping at connections to equipment.
6. Pipe Hangers, Supports and Accessories:
 - a. All piping shall be supported per the International Fuel Gas Code, Chapter No. 4.
 - b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated with zinc Chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
 - c. Floor, Wall and Ceiling Plates, Supports, Hangers:
 - 1) Solid or split unplated cast iron, chrome plated in finished areas.
 - 2) All plates shall be provided with set screws.
 - 3) Pipe Hangers: Height adjustable clevis type.
 - 4) Adjustable Floor Rests and Base Flanges: Steel.
 - 5) Concrete Inserts: "Universal" or continuous slotted type.
 - 6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
 - 7) Riser Clamps: Malleable iron or steel.
 - 8) Rollers: Cast iron.
 - 9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
 - 10) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories.

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7. Install cast chrome plated escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
8. Penetrations:
 - a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases. Completely fill and seal clearances between piping and openings with the fire stopping materials.
 - b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with appropriate sealant.

B. Piping shall conform to the following:

1. Fuel Gas:
 - a. Entire fuel gas piping installation shall be in accordance with requirements of NFPA 54.
 - b. Provide fuel gas piping with plugged drip pockets at low points.

3.2. CLEANING OF SYSTEM AFTER INSTALLATION

A. Clean all piping systems to remove all dirt, coatings and debris.

3.3 TESTING

- A. General: Test system either in its entirety or in sections after system is installed and cleaned.
- B. Test shall be made in accordance with Section 406 of the International Fuel Gas Code. The system shall be tested at a minimum of 1.5 times maximum working pressure, but not less than 30 psig (20 kPa) gage.

END OF SECTION 22 16 00

FORD FIELDS CONCESSION STAND BEAUMONT,
TEXAS

CERTIFICATION OF RESPONSIBILITY FOR
DOCUMENT PREPARATION

FORD PARK-FORD FIELDS CONCESSION STAND
RCE Project No.: 190007

MECHANICAL SPECIFICATIONS

THE FOLLOWING SPECIFICATION SECTIONS INCLUDED IN THIS PROJECT MANUAL
WERE PREPARED BY OR UNDER THE RESPONSIBLE SUPERVISION OF THE COMPANY
LISTED BELOW:

23 05 00	GENERAL PROVISIONS FOR HVAC
23 05 03	BASIC MATERIALS AND METHODS FOR HVAC
23 05 93	TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 07 00	MECHANICAL INSULATION
23 09 00	TEMPERATURE CONTROLS FOR HVAC
23 28 13	COMMERCIAL KITCHEN HOODS
23 30 00	AIR DISTRIBUTION FOR HVAC
23 70 00	AIR CONDITIONING FOR HVAC



A handwritten signature in blue ink that reads "Andrea Manceaux".

3/15/19

Andrea

Manceaux, P.E.
Ritter Consulting Engineers Ltd.

FORD FIELDS CONCESSION STAND BEAUMONT,
TEXAS

SECTION 23 05 00 - GENERAL PROVISIONS FOR HVAC

PART 1 - GENERAL

1.1 DIVISION OF SPECIFICATIONS

A. For Bidder's convenience only, this Division of the Specifications is divided into the following parts:

23 05 00	GENERAL PROVISIONS FOR HVAC
23 05 03	BASIC MATERIALS AND METHODS FOR HVAC
23 05 93	TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 07 00	MECHANICAL INSULATION
23 09 00	TEMPERATURE CONTROLS FOR HVAC
23 28 13	COMMERCIAL KITCHEN HOODS
23 30 00	AIR DISTRIBUTION FOR HVAC
23 70 00	AIR CONDITIONING FOR HVAC

1.2 GENERAL CONDITIONS

A. The General Conditions of the Architectural Specifications along with supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein. The contractor shall review Architectural General Conditions. Where the requirements of Architectural General Conditions and these specs conflict for the contractor, the most stringent shall be applied.

B. Mechanical subcontractor shall be the sole source responsible party to furnish and install the mechanical system. Mechanical contractor shall be properly licensed to perform this work.

C. Wherever the word contractor is mentioned in Division 23 of these specifications, it is intended to mean the Mechanical Contractor as appropriate. These are sub-contractors to the General Contractor who has the contract with the owner. It is the General contractor who bears the responsibility to fulfill this part of the project (Division 23 – Mechanical) under the contract with the owner. The General contractor shall be responsible for all costs associated with any and all bidding errors and omissions of the sub-contractor.

1.3 SCOPE OF WORK

A. Furnish labor, materials and equipment necessary to provide and install the complete mechanical portion of this contract, including air conditioning, heating, and ventilating systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination at the contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items

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TEXAS

GENERAL PROVISIONS FOR HVAC 23 05 00 - 1/14 covered in the Mechanical Division
have been included if he chooses to accept separate bids.

- B. Contractor shall refer to the Architectural, Structural, Plumbing and Electrical drawings and install all equipment, piping, etc., to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in space provided or coordinated with other trades involved on the project.
- C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc., necessary to provide a satisfactory installation in working order and in accordance with all Federal, State, and local codes and ordinances.
- D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the contractor from the responsibility of installing his work to meet conditions.
- E. Lack of coordination shall not be acceptable and shall not be a reason for poorly installed work or additional cost to this trade or others on the project. All associated extra cost shall be borne by the contractor. The General Contractor shall be responsible for all costs, time, and liquidated damages associated with lack of coordination or poor coordination.

1.4 LOCAL CONDITIONS

- A. Location and elevation of all services is based on information obtained from the Owner. However, this shall serve as a general guide only and the contractor shall visit the site and verify the location and elevation of this service to his own satisfaction in order to determine the amount of work required for the execution of the contract.
- B. Contractor shall contact the various utility companies, determine the extent of their requirements and cooperate with the utility company in reaching a finished product. Contractor shall pay charges by Utility Company for extensions, connections meter fees, street patching, etc.
- C. In case major changes are required, this fact, together with the reasons therefore, shall be submitted to the Architect, in writing, not less than seven days before the date of bidding. Failure to comply with this requirement will make the contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.5 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor with the Mechanical Contractor responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimbled without first receiving the approval of the Architect/Engineer. After initial surfacing has been done, any further cutting, patching and painting shall be done at this contractor's expense.

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- B. Cutting and patching shall be done in such a manner that the surrounding work will be restored to its original condition.
- C. The HVAC piping shall be run in such a manner as to avoid conflicts with other trades. It may be necessary to penetrate beams, grade beams, footings, and foundations.
Install thimbles as required and as approved by the Structural Engineer and Architect.

1.6 CODES AND STANDARDS

- A. The entire mechanical work shall comply with the rules and regulations of the City, County and State in which this project is being constructed including the State Fire Marshal and State Board of Health. All modifications required by these authorities shall be made without additional charge to the Owners. The Mechanical Contractor shall report these changes to the Architect and secure his approval before work is started.
- B. In addition to the codes mentioned, all mechanical work and equipment shall conform to the applicable portions of the following Specifications, codes and regulations:
 1. American Society of Heating, Refrigeration and Air Conditioning Engineers
 2. National Electric Code
 3. National Fire Protection Association
 4. American Society of Mechanical Engineers
 5. Underwriters's Laboratories
 6. American Gas Association
 7. Energy Code for Commercial and High Rise Residential Buildings
 8. International Energy Conservation Code
 9. International Building Code
 10. International Mechanical Code
 11. SMACNA Guidelines
- C. Materials, equipment and accessories installed under this contract shall conform to all rules, codes, etc., as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. Materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, contractor shall submit a sample for approval before proceeding.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories whether or not called for in these Specifications.
- E. Material and equipment furnished or installed as part of these construction documents shall be installed and operated in strict accordance with the respective manufacturer's guidelines for installation and operating instructions. The manufacturer's guidelines shall become part of the construction documents.

1.7 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown and such deviations are permissible and shall be made as required, but, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes or to change the shape of ducts and these changes shall be made as required. All such changes shall be referred to the Architect for approval before proceeding. Extra charges shall not be allowed for these changes.
- B. No structural beams or joists (concrete or steel) shall be cut or thimbled without first receiving the approval of the Architect/Structural Engineer. After initial surfacing has been done, any further cutting, patching and painting shall be done at the Mechanical Contractor's own expense.
- C. Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project without drawing on the contractor's experience or ingenuity. However, only typical details are shown on the plans. In cases where the contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details shall not be an excuse for improper installation. Submit installation shop drawings with manufacturer's details for review prior to installation.
- D. In general, the drawings are diagrammatic and the contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which equipment, piping, etc., is to be relocated regardless of which item was first installed.
- E. Materials and equipment furnished or installed as part of these construction documents shall be installed and operated in strict accordance with the respective manufacturer's guidelines for installation and operating instructions. The manufacturer's guidelines shall become part of the construction documents.

1.8 WORKMANSHIP

- A. Workmanship shall be of highest grade, and all construction shall be done according to the best practice of the trade. Work shall be completed to satisfaction of the Architect/Engineer.

1.9 COORDINATION

- A. Coordinate work of the different trades to avoid interferences between mechanical and all other work. All piping, ductwork, etc., shall be installed in lines as required to accomplish this end whether or not shown on the plans.

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- B. There will be a certain amount of work which must be coordinated with the Owner. This contractor shall coordinate required work with the Owner through the General Contractor using procedures acceptable to the Architect and Owner. The contractor shall maintain documentation of coordinated work.
- C. This contractor shall coordinate and confirm that all equipment requiring electric service will be adequately and properly serviced by Electrical Contractor. Any conflicts shall be brought to the attention of the Architect/Engineer prior to ordering the equipment.
- D. This contractor shall coordinate the space clearances required for the HVAC ductwork with the structure, ceilings, lights, sprinklers, etc. In some cases, due to space limitations, it may be necessary to re-size ductwork to meet the conditions of the project. **Any resizing required shall be part of this project and done without any additional cost to the Owner. DO NOT MAKE DUCTWORK WITHOUT COORDINATION. Avoid conflicts with other trades.**
- E. This contractor shall coordinate the installation of HVAC piping with all parts of the structural foundation system and structural building systems. Provide sleeves through graded beams at all conflicts. All points of penetration of foundation shall be reviewed by the Architect/Engineer prior to rough-in. All sleeves shall be installed per instructions and details of the structural engineer.
- F. All piping shall be run as high as possible with sleeves through concrete beams to avoid conflicts. This means the piping shall run in or through the structure unless approved otherwise by the Architect/Engineer.

1.10 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these requests for acceptance of products must be received by the Architect a minimum of 10 days prior to bid date. Submission shall include manufacturer's name, model number, rating table and construction features. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. The contractor shall base his bid solely on those items specified or included in the "Prior Approval Addendum" as no other item will be acceptable. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the contractor of the responsibility of assuring himself that this equipment is in complete accord with plans and Specifications and will fit into the space provided. Submit shop drawings on all items of equipment for approval as hereinafter specified.
- B. Should a substitution or variation occur, the better quality or greater quantity of material or work shall be furnished. This also does not preclude other manufacturers if they meet the following criteria:

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1. Product proposed for substitution shall be equal or superior to that specified in construction, efficiency, utility and function.
2. Physical size of substitute brand shall not be greater than space provided for it.
3. Profile of substitution shall be same concerning size, shape, indentations, recesses, etc.
4. Complete illustrations, specifications and description of substitution shall be submitted for approval.
5. Availability and proximity of manufacturer's service representative shall be factors considered in substitution approval.
6. Substitution and/or variations shall be reviewed and allowed when there is no change in cost to the project and shall be made at the discretion of the Engineer.

1.11 SHOP DRAWINGS

- A. The General Contractor shall submit all submittals within 30 days of the date of the contract between owner and contractor or the date of notice to proceed as issued by the owner to the General Contractor. The submittals shall have been submitted to the General Contractor within 30 days after the construction contract has been signed. The General Contractor and his sub-contractors shall bear all responsibility for any extra costs or delays to late submittals of shop drawings.
- B. Drawings shall be presented in a clear and thorough manner.
- C. Details shall be identified by reference to sheet detail, schedule or room numbers shown on contract and drawings.
- D. Drawings shall contain the following information:
 1. Date.
 2. Number of the drawing or revision.
 3. Name of project or facility.
 4. Name of contractor and subcontractor.
 5. Clear identification of contents and location of work.
- E. Preparation:
 1. Clearly mark each copy to identify pertinent products or models.
 2. Show performance characteristics and capacities.
 3. Show dimensions and clearances required.
 4. Show wiring or piping diagrams and controls.
 5. Show weights and mounting data.
 6. Provide letter documentation confirming that all coordination with other trades effected have been done. This is especially necessary with the electrical requirements and rough-in requirements.
- F. Manufacturer's standard schematic drawings and diagrams:
 1. Modify drawings and diagrams to delete information which is not applicable to the work.

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2. Supplement standard information to provide information specifically applicable to the work.

G. Office samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product, with integral related parts and attachment devices.
2. Full range of color, texture and pattern.

H. HVAC ductwork shop drawings shall be prepared showing all conditions of installation coordinated with structure, lights, sprinklers, ceiling, etc. These shop drawings shall be prepared within 45 days of the award of the general contract for the project. Drawings shall be done at minimum 1/8 inch scale on 24 inch x 36 inch sheets.

I. Equipment shop drawing shall be prepared by the contractor/supplier. These shop drawing shall include the manufacturer's performance data and installation manuals. In addition, the shop drawings shall show the installation specific to this project.

J. Assemble certificates, executed by each of the respective manufacturers, suppliers, and subcontractors.

K. All submittals shall be submitted prepaid and in ample time for review before installation.

L. Six (6) copies of each submittal shall be submitted to the Architect.

M. These shop drawings shall be supplied as part of this contractor's contract. Any drawings not approved shall be resubmitted until approved. Submit all shop drawings at the same time. No separate items will be accepted (except in the case of the HVAC ductwork shop drawings).

N. Time necessary for review of samples, certificates, test reports, and shop drawings is at least 30 calendar days after receipt of the item. All materials installed in the work shall match the reviewed submittals. After a submission has been reviewed, no substitutions will be permitted without written approval by the Architect.

O. The Architect's/Engineer's review of shop drawings shall not relieve the contractor from the responsibility of incorrectly figured dimensions or any other errors that may be contained in these drawings. The omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the contractor from furnishing and erecting same.

P. Any delays caused by contractor not submitting shop drawings within a timely manner shall be the problem of the responsible subcontractor and the General Contractor.

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1.12 REPAIRING ROADWAYS AND WALKS

- A. Where this contractor cuts or breaks roadways or walks to lay the piping, he shall repair or replace these sections to meet the Architect's approval. Repair of public roadways

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and highways shall be done as per the Federal, State of Local agencies having jurisdiction. Contractor shall obtain and pay for all permits.

1.13 MATERIALS

A. Work materials shall be new and the best of their respective kinds, and shall bear the label of NFPA, ASME Code, AGA, and UL where such standard has been established for the particular item of equipment used.

1.14 MATERIAL STORAGE

- A. General: Provide space for storage of material and equipment at ground level. Roof surfaces shall not be used for storage of materials or equipment. Any storage within the building shall be approved by the Architect/Engineer prior to use of the space.
- B. Exterior: Pipe, fitting, or other materials stored outside of building shall be set on wood or steel racks or platforms inside storage container units. All necessary provisions shall be made to keep water and debris away from such stored material. Ends of pipes and valves shall be kept sealed until used.
- C. Warehousing: Equipment subject to rusting shall be kept warehoused until just prior to setting. If necessary the warehouse shall have climate controlled conditions.
- D. Offsite warehousing shall be approved by the Architect and Owner only.
- E. Any warehousing used shall be approved by the Owner and an insurance certificate naming the Owner as insured shall be provided to the Owner.

1.15 GROUNDS AND CHASES

A. Contractor shall see that all required chases, sleeves, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise he shall bear the cost of providing them.

1.16 MACHINERY GUARDS

A. Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. Guard shall enclose the drive entirely and shall have a hole for taking tachometer reading.

1.17 SPECIAL TOOLS

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A. Special tools required for proper operation or maintenance of any mechanical equipment provided under this contract shall be delivered to the Owner at the completion of the project.

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1.18 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.
- B. This contractor shall flush systems as required per local and state jurisdictions and equipment/material manufacturer's guidelines (chlorination, chemical treatment, etc.).

1.19 EQUIPMENT ACCESS

- A. Large equipment to be installed in building, which is too large to permit access through doorways, shall be brought to the job by the contractor and placed before enclosing structure. Equipment shall be cribbed up from the floor by the contractor and covered where necessary or directed.

1.20 EQUIPMENT IDENTIFICATION

- A. Stenciling: All items of major mechanical equipment (pumps, AHUs, starters, valves, etc.) shall be neatly and clearly stenciled in letters not less than 1 inch high, with the same designation as appears on drawing. Location and color of such stenciling shall be appropriate for ready identification and/or as directed by the Architect. One set of compatible metal interlocking stencil letters and numbers shall be turned over to the Owner at the completion of the job. At contractor's option engraved plastic adhesive tags may be used. Tags used outdoors shall be listed for such use.
- B. Pipe Coding: All piping, etc., both insulated and bare, shall be color coded with a general purpose pipe marker for interior locations and a 6 inch enamel painted bar for exterior locations, and stenciled as to service and characteristics on the 10 foot centers and/or as directed. Directional arrows not less than 1/2 inch wide and not less than 6 inches long shall be permanently stenciled on each line at each stencil location. Stenciling shall be located such that it is clearly visible from floor or adjacent service platform. Coding shall be as per schedule approved by Owner through submittal to Architect. At contractor's option, pre-manufactured vinyl pipe labels and directional arrows may be used but shall be banded on either end to secure to pipe.
- C. Valve tags shall be installed on all valves controlling building zones, areas, or equipment. Valve tags shall be 2 inch diameter brass stenciled with valve number. A framed list of valves with associated numbers, sizes and locations shall be mounted in the building as directed by Architect.

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1.21 TEMPORARY USE OF EQUIPMENT

A. The permanent equipment installation shall not be used for temporary purposes by the contractor for temporary conditioning of the building during construction. Contractor

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shall provide temporary dehumidification and drying equipment as required to maintain clean, dry air during construction.

B. Acceptable Use Without Specific Authorization: Temporary use shall not be construed to mean "bumping" of electric motors on equipment to verify rotation direction nor short time operation of systems for test purposes, operation of refrigeration and heating system for short periods to adjust controls and temperature regulation, or the operation of fans for air balance.

1.22 CLEANING AND ADJUSTING

A. Upon completion of his work, the contractor shall clean and adjust all equipment, controls, valves, etc. Clean all piping, ductwork, etc., and leave entire installation in good working order.

1.23 PAINTING

A. This contractor shall obtain the services of a painting sub-contractor as part of the contract with the General Contractor for all painting.

B. General: Except for standard factory finishes, all pipe, pipe covering, ducts, equipment, supports, hangers, etc., exposed inside and outside building or in equipment room shall be painted. This contractor shall prepare surface of material to receive first coat of paint. All subsequent coatings shall be prepared by Painting Subcontractor. Requirements covering paints, workmanship and preparation of surfaces as stated in Architectural Specifications shall govern. Color coding shall be approved by Architect (submit color sample). All submittals for review shall be through Architect.

C. Damage: Where standard equipment factory finishes have been damaged or scratched, the damaged area shall be repaired or replaced by the contractor to match the original finish.

D. Preparation: Thoroughly clean surfaces of all rust, scale, cement, and dirt from all equipment, piping or other work installed and leave ready for finish painting.

E. All exposed piping shall be painted. Paint with two (2) coats of paint. The color shall be industry standard color coding. Submit color code chart with sample color chips to Architect for review prior to starting work.

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1.24 FIRESTOPPING

- A. Penetrations through rated construction shall be sealed with a material capable of preventing the passage of flames and hot gases when tested in accordance with ASTMEB14.
- B. Notify Architect for inspection of all completed fire and/or smoke barrier walls before any construction is installed that may conceal the firestopping material installation.

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- C. Access to random selected areas may be required by the architect at the time of final inspection should notification not be given.
- D. Provide detailed instructive cutsheets of fire penetration sealing system (firestopping) used to the architect at the time of inspection. Random selective sampling by the contractor will be observed by the architect and State Fire Marshal.

1.25 NOISE VIBRATION

- A. General: Take the utmost precautions in the installation of the equipment, piping, and duct systems to prevent noise and vibration transmission. Noise levels determined by octave band analysis with all components of the mechanical system operating and the building completely furnished shall not exceed NC-35 in operations and office areas, and shall not exceed NC-45 in equipment areas. Where equipment and installations do not meet these limits, the contractor must provide necessary attenuation to reduce net noise levels to the above requirements.
- B. Isolation of equipment: Equipment that would tend to cause noise or vibration shall be isolated to prevent noise transmission to the building or to other equipment.
- C. Equipment Connections: Piping, conduit, or other connections to equipment shall be isolated. The contractor shall be responsible for the prevention of noise and vibration transmission through these connections to equipment.

1.26 PERMITS, INSPECTIONS AND TESTS

- A. Contractor shall obtain and pay for permits, fees, etc., for the installation, inspection, service connections, verifying location or construction of the work which are required by any authority and/or agencies having jurisdiction.
- B. Contractor shall arrange and pay for inspections, examinations and tests required to obtain complete and final acceptance of all mechanical systems. Contractor shall deliver certificates of all such inspections to the Architect.
- C. Contractor shall notify Architect and local governing authorities before any tests are made and tests are not to be drawn off a line covered or insulated until examined and

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approved by the authorities. In the event defects are found, these shall be corrected and the work shall be retested.

D. Prior to requesting final inspection by the Architect, the contractor shall have a complete coordination and adjustment meeting of all of his subcontractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing 10 days prior to this meeting instructing him of the time, date and whom you are requesting be present. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

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1.27 TRAINING OF MAINTENANCE PERSONNEL

- A. Contractor shall provide on the job training for Owner's personnel upon completion of the work including testing and adjustment. Minimum 20 hours of onsite training shall include maintenance checks, lubrication of components, adjustment of control set points, and troubleshooting techniques of the air conditioning unit.
- B. Contractor shall use factory start-up personnel to train the owner's maintenance personnel.

1.28 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Provide Owner with four (4) copies of printed instructions indicating various pieces of equipment by name and model number complete with parts lists and maintenance and repair instructions. This information shall be bound in plastic covered notebooks. Submit the manuals to the Architect for approval.
- B. Include all warranty certificates or statements in a separate section of the manuals. Provide all materials and test certificates for the final inspection.
- C. Provide three (3) sets of DVDs of the operation and maintenance manuals.

1.29 GUARANTEE

- A. Contractor shall guarantee all materials, equipment and workmanship for a period of one year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc., necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Additional warranties beyond the above shall be furnished as specified elsewhere in these specifications.
- B. If the contractor's office is in excess of a 50 mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

1.30 WARRANTIES

- A. Assemble warranties executed by each of the respective manufacturers, suppliers, and subcontractors into a warranty book and prepare a table of contents.
- B. Two (2) original signed copies of each warranty are required.

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C. Provide complete information for each item including:

1. Product and work item.
2. Local supplying firm or manufacturer's dealer, with name of principal, address and telephone number.
3. Scope of warranty.
4. Date of beginning of warranty.
5. Duration of warranty.
6. Provide information for Owner:
 - a. Proper procedure to evoke the warranty in case of failure.
 - b. Instances which might affect the validity of the warranty.
7. Contractor, name of responsible principal, address and telephone number.
8. All contractors and manufacturers equipment warranties shall start at the acceptance of the project by the Owner.
9. Provide owner with contact information for warranties which extend beyond one year.

1.31 RECORD DRAWINGS

A. Contractor shall maintain two (2) sets of drawings of the original construction documents to utilize as markup sets to record field modifications from original construction documents. Once approval has been gained from the Architect, the contractor shall record these variances on the two (2) sets in a neat and readable manner. Noted shall be sizes, locations, changes in directions, etc. with distances dimensioned from columns, walls, inverts, etc. The maintenance and cost of these documents shall be the responsibility of the contractor.

1.32 DEMOLITION

A. This contractor shall do all demolition as shown on the plans. The contractor shall make the areas ready for the new construction work. All demolition debris, piping, equipment, etc., shall be removed from the site by this contractor. All demolition work shall be scheduled through the General Contractor to prevent interruption of any existing services. Do not start any demolition which would interrupt the building operation without scheduling with the Owner (schedule through the General Contractor).

B. The Owner shall retain first salvage rights to anything within the demolition area. If the Owner selected an item to be retained, then this contractor shall remove it with care and deliver the item to the Owner designated location on site. Anything not retained by the Owner shall become the property of the contractor and be removed from the site.

1.33 MATERIALS CONTAINING HAZARDOUS SUBSTANCES OR COMPONENTS

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- A. This contractor shall not provide any material or component of equipment which contains asbestos, lead based paint or PCBs. The contractor shall provide certificates or manufacturer's statements/letters to show that the products and/or building materials do not contain asbestos, lead based paint or PCBs.
- B. If any product or building material is found to contain asbestos, lead based paint or PCBs, the contractor shall bear all cost for removal, abatement, and disposal of materials in accordance with all state and federal regulations. The contractor shall install replacement materials to the satisfaction of the Architect at no additional cost to the project.
- C. During the construction, if the contractor suspects that any material in the building contains or is a hazard material (asbestos, lead, PCB, mercury, etc.) work shall be stopped to prevent disturbance and the Owner shall be notified immediately.

END OF SECTION 23 05 00

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SECTION 23 05 03 - BASIC MATERIALS AND METHODS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Type of piping for various systems shall be as specified herein.
- B. All pipe shall be true and straight without sags or traps.

PART 2 - MATERIALS

2.1 REFRIGERANT PIPING/EQUIPMENT DRAIN PIPING

- A. All refrigerant and equipment drain piping shall be government type "L" hard copper tube standard weight and thickness as made by Mueller, Chase, Anaconda or equivalent, unless indicated otherwise. Use Silfos 1000 degrees Fahrenheit solder on all joints.
- B. Tubing shall be brought to the site with ends sealed.

2.2 A/C CONDENSATE DRAIN PIPING

- A. All A/C condensate drain piping shall be government type "L" hard copper water tube of standard weight and thickness. Fittings shall be compatible with pipe. Use Silfos 1000 degrees Fahrenheit solder on all joints.

2.3 PIPE FITTINGS

- A. All pipe fittings shall be same as piping specified unless indicated otherwise.
- B. Fittings for refrigerant piping and other copper lines shall be solder type wrought copper, Nibco or equivalent.

2.4 PIPE SPECIALTIES

- A. Dielectric unions shall be used between copper and iron pipe.

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2.5 PIPE HANGERS AND SUPPORTS

- A. This contractor shall furnish and install all foundations and supports required for his equipment unless indicated otherwise on the drawings.
- B. This contractor shall furnish and install all escutcheons, inserts, thimbles, hangers, etc., required for the proper support and installation of his equipment and piping. Cooperate with other trades in locating and placing these items.
- C. Provide sleeves for all pipes passing through walls, floors, beams, etc. Sleeves passing through structural members shall be of cast iron or Schedule 40 steel pipe. Sleeves passing through nonstructural walls or floors shall be of Schedule 10 galvanized iron. Joints between sleeves and pipes passing through floors shall be made watertight with plastic materials. Where pipes pass through floors shall be made watertight with plastic materials. Where pipes pass through waterproofing membrane, flashing sleeves shall be installed.
- D. Provide malleable iron split ring hangers with rod supports throughout. Strap hangers or wire will not be accepted. Maximum spacing of hangers shall be 5 feet.
- E. Provide galvanized iron shields between hangers and pipe covering.
- F. Provide chrome plated brass escutcheons wherever pipes pass through floors, walls or ceilings in exposed or finished areas.
- G. All piping projecting from chases shall be rigidly supported in the wall or chase. Loosely supported fixtures or accessories will not be accepted.

2.6 VALVES AND UNIONS

- A. Furnish and install all valves, unions, stops, connections, etc., shown on plans and necessary to make a complete system in working order. Provide valves on inlet and outlet of all equipment and fixtures and on branch lines to fixtures or groups of fixtures, refer to Division 22.

2.7 MOTORS STARTERS AND ELECTRICAL WORK

- A. The Mechanical Contractor shall furnish to Electrical Contractor for installation, all motor starters, start-stop push buttons and pilot lights for each piece of motor driven equipment unless shown otherwise.
- B. The Electrical Contractor shall install all motor starters, start-stop push buttons and pilot lights as furnished by the Mechanical Contractor. The Electrical Contractor shall do all power wiring required for the installation of all mechanical equipment including equipment interlocking power wiring, etc. Temperature control wiring shall be furnished and installed

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by the Mechanical Contractor. All work shall be done in accordance with the National Electrical Code requirements and with wiring workmanship, etc., as called for in the Electrical Specifications. The Mechanical Contractor shall provide approved wiring diagrams of all equipment, controls, etc., to the Electrical Contractor for his installation. Coordinate all work to provide a complete system in working order. All wiring shall be plenum rated.

- C. All motors for the mechanical equipment shall be of the 40 degrees Celsius rise type and shall be furnished and installed by the Mechanical Contractor. All motors shall be wound for +/- 10 percent of the specified voltage. Motors shall be voltages indicated on drawings. All motors shall have copper windings, Class F insulation and shall be rated for continuous duty service. All three-phase motors shall be inverter-duty type motors.
- D. All electrical equipment shall have UL label or ETL label and shall meet the standards of the National Electrical Code and NEMA.
- E. Starters for single phase motors 1/2 HP and below shall be furnished with pilot light and "hand-off-auto" selector switch where required.
- F. Starters for three-phase, single speed motors shall be stepless solid state soft starter with "hand-off-auto" selector switch, three overload relays and auxiliary contacts as required. The starter shall operate at manufacturers ratings with 10 percent and -15 percent applied voltage tolerance and be capable of operating continuously under ambient temperatures of 0 to 50 degrees Celsius. The starter control circuitry shall be designed for current ramp operation and utilize current feedback for closed loop operation to minimize variation of acceleration time with varying load conditions. The starter shall use metal oxide varistors to clip transient voltage spikes on incoming power lines with protection to limit the rate of rise of voltage spikes to protect the SCR's from damage. The starter shall provide electronic motor overload protection. The starter shall shut down (or shall not start) to protect itself from either phase loss or phase rotation. The starter shall have adjustments for initial torque, pulse, ramp up time, ramp down time, and current limit. The starter shall have a main trip breaker to act as a disconnect and necessary contactors. The starter shall have contacts for remote starting from a building energy management system.
- G. Mechanical contractor shall provide and install all smoke dampers and smoke or duct detectors. The electrical contractor shall provide and install all wiring/interlocks with fire alarm.

2.8 ACCESS PANELS

- A. Furnish and install access panels where valves, dampers, etc., are concealed in walls, ceilings, floors or otherwise inaccessible. Panels shall be Milcor, Babcock, Larsen, MIFAB, Acudor, Nystrom or equivalent. All access panels shall be minimum 18 inches X 18 inches hinged with flush latch and lock. The panels shall be constructed of minimum 18 gauge stainless steel. Frame flange shall be minimum 1-1/2 inches wide. Rated panels shall have U.L. rating for type wall or ceiling where located.

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B. Access panels located in rated walls, floors, or ceilings shall be so rated and installed per manufacturer's recommendations to maintain rated integrity.

PART 3 - EXECUTION

3.1 PIPING

A. Perforated strap hangers shall not be allowed for any part of the hangers.

B. Pipe shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Service pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not 1/2 inch between finished covering on the different services.

C. Expansion and contraction of piping: Allowance for expansion and contraction shall be made throughout. Sufficient flexibility shall be provided for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that the piping will spring enough to allow for expansion without straining.

D. Joints: Tubing shall be cut square, and butts shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendation. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a noncorrosive paste flux and solid string of wire solder. Cored solder will not be permitted.

E. Pipe sleeve, hangers, and supports: These items shall be furnished and set and the contractor shall be responsible for their proper and permanent location.

1. Pipe sleeves - Install sleeves for all pipes passing through footings, floors, and walls. Clearance between sleeves and pipe covering and/or pipes shall be approximately 1/4 inch. Construction shall not be cut except where approved by the Architect. Where cutting of construction is permitted, the construction shall be repaired to match its original condition. Sleeves shall not be installed in structural members except where indicated. Sleeves are not required for wall hydrants.
 - a. Install sleeves for pipes that pass through walls. Sleeves that pass through walls shall be cut flush with surfaces. The space between sleeves and pipe or covering shall be sealed with graphite packing and synthetic rubber caulking compound.
 - b. Install sleeves where pipes pass through waterproofing membrane. The sleeves shall be provided with an integral flashing flange or a clamping

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device to which a 4 pound lead flashing shield shall be clamped or soldered. The shield shall extend 12 inches from the pipe and shall be thoroughly mopped into the membrane. The space between the sleeve and pipe shall be made watertight by inserting an oakum gasket, filling the remaining space with lead, and thoroughly caulking.

2. Threaded pipe - Support pipes at 4 foot intervals.
3. Copper tubing - Support tubing at not more than 5 foot intervals. Hangers for copper tubing except where protective shields are installed shall have proper size rings to suit outside diameter of tubing and the hangers or supports shall be copper or copper plated at contact surfaces.
4. Underground piping - Lay pipe on a firm bed for its entire length, except where support is otherwise provided.
5. Vertical piping - Supports shall be at each floor. Horizontal piping - Hangers and supports shall be installed at locations not more than 3 feet from the end of each run out. A hanger shall be installed not over 1 foot from each change in direction of piping.

F. Unions: Provide nonconducting type connections wherever jointing dissimilar metals in open systems. Brass adapters and valves are acceptable.

END OF SECTION 23 05 03

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All Division 23 Specification Sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.2 SCOPE OF WORK

- A. The Mechanical Contractor shall obtain the services of an independent test and balance company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s). These services shall not be provided by the installing mechanical contractor on the project but shall be a direct subcontractor of the mechanical contractor.

- 1. Agency shall provide proof of having successfully completed at least five projects of similar size and scope. Work by this Agency shall be done under direct supervision of a qualified Heating and Ventilating Technician employed by Agency.
- 2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
- 3. If requested, conduct tests in presence of Engineer.
- 4. Agency shall be approved in writing by Engineer. Mechanical Contractor shall not be permitted to do this work. Submit qualifications for review.

- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these Specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results.

- C. **Test and Balance agency shall be present for factory start-up of equipment when factory startup is required.**

- D. Representatives of the test and balance company shall visit the job to review the installation. After each site visit, the test and balance company shall report to the Architect any items that are not installed properly, are missing from the Contract Documents or items that are required to enable him to perform the testing and balancing of the HVAC systems as per normal standard practice. After review, the Architect shall instruct the contractor to implement the recommendations at no additional cost to the Owner if these items were specified in the original scope of the project.

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- E. Upon completion of the HVAC system installation, the test and balance company shall perform all testing and balancing with the full cooperation of the contractor and his subcontractors. The contractor shall make changes and/or adjustments to the HVAC system components that are required by the test and balance company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work by the contractor shall be performed at no additional cost to the Owner.
- F. Balancing agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two (2) copies of air balancing test report.
- G. The test and balance report shall be submitted to the Architect for review by his Mechanical Engineer. If the Mechanical Engineer agrees with the report, he shall sign it and return it to the Architect. If he does not concur with the report, he shall meet with the Test and Balance Company to determine what needs to be done to obtain a properly balanced system.
- H. After the Mechanical Engineer signs the testing and balancing report, the Test and Balance Company shall supply four (4) copies of the final and complete report to the Architect for inclusion in the Operation and Maintenance Manuals.

1.3 The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

A. AIR SYSTEMS:

Air Handling Units
Fans
Zone Branch and Main Ducts
Diffusers, Registers, Grilles and
Dampers Coils (Air Temperatures)
Valves
Vibration Isolators
Duct Smoke/Pressure Leak Testing

1.4 SCHEDULING

A. Award test and balance contract to approved agency upon receipt of contract to proceed to allow Agency to schedule this work in cooperation with other Sections involved and comply with completion date.

1.5 DEFINITIONS, REFERENCES, STANDARDS

A. All work shall be in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards or the latest standards of the National

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Environmental Balancing Bureau (NEBB). If these contract documents set forth more stringent requirements than the AABC National Standards or the NEBB Standards, these contract documents shall prevail.

1.6 QUALIFICATIONS

- A. Agency Qualifications: The TAB agency shall be a current member of the AABC,NEBB or TABB.
- B. Prior to working on this project, the technicians shall attend training provided by the manufacturer of the various equipment on this project on the specific aspects of balancing the equipment. Include letters or certificates from the manufacturer on attendance and satisfactory completion of the factory training. These certifications may be used for continuing education. At a minimum, the technicians shall receive training from the air distribution equipment manufacturer, air unit manufacturer, and temperature controls manufacturer. This should be done prior to any equipment start-ups.

1.7 SUBMITTALS

- A. Qualifications: The TAB agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) or technician certificate.
- B. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- C. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards or the NEBB Standards.
- D. Submit continuing educations training on each lead technician working on the project.

1.8 TAB PREPARATION AND COORDINATION

- A. Shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work shall be provided when available and no later than 30 days prior to the start of TAB work.
- B. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin.
- C. The building control system (BCS) contractor shall provide and install the control system, including all temperature, pressure and humidity sensors. These shall be calibrated for

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accurate control. If applicable, the BCS contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution. The BCA contractor shall provide all necessary software to the TAB Agency at no additional cost.

- D. All test points, balancing devices, identification tags, etc., shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- E. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.
- F. If, upon commencing the work, the TAB contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the TAB contractor may request an inspection to be made by the Designer's Mechanical Engineer. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for testing and balancing. Items that are determined to be not ready for testing and balancing shall be completed by the Mechanical Contractor and placed in operational readiness before TAB services are again requested.

1.9 TAB REPORTS

- A. Final TAB Report: The TAB agency shall submit the final TAB report for review by the Engineer. On plans provided, all outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC or NEBB "National Project Performance Guaranty" assuring that the project systems were tested, adjusted and balanced in accordance with the project Specifications and AABC or NEBB National Standards.
- B. Submit four (4) copies of the final TAB report to the Architect for inclusion in the Operation and Maintenance Manuals.

PART 2 - INSTRUMENTATION

- 2.1** All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC or NEBB National Standards.

PART 3 - EXECUTION

3.1 GENERAL

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- A. General Contractor with Mechanical Contractor shall put heating, ventilating, and cooling systems and equipment into full operation and continue their operation during each working day of testing and balancing.
- B. Air Balance and Testing Agency shall perform tests specified, compile test data, and submit four (4) copies of complete test data to contractor for forwarding to Engineer for evaluation and approval.
 - 1. Approved copies of report shall be bound in Operations and Maintenance manuals.
- C. System shall be completely balanced and all reports submitted to Engineer prior to prefinal inspection.
- D. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC or NEBB National Standards. Adjustment tolerances shall be + or -10 percent unless otherwise stated.
- E. Equipment settings, including manual damper quadrant positions, valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.
- F. All information necessary to complete a proper TAB project and report shall be per AABC or NEBB standards unless otherwise noted. The descriptions of work required, as listed in this section, are a guide to the minimum information needed.
- G. TAB contractor shall cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. Upon completion, patch insulation, ductwork and housings using materials identical to those removed. Seal insulation to reestablish integrity of the vapor barrier.
- H. TAB work shall include additional inspection and adjustment of components during the season following the initial balance to include re-balance of any items influenced by seasonal changes or as directed by the Owner.

3.2 AIR SYSTEMS

A. TESTING PROCEDURE

Air Balance and Testing Agency shall perform following tests and balance system in accordance with following requirements. Perform the following tests at high and low speeds of multi-speed systems and single speed system.

- 1. Make periodic inspections of the installation of the systems. Provide reports of each inspection. Coordinate and verify the installation of all balancing dampers, fire dampers, etc.

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2. Smoke test or pressure test each low pressure steel duct system to test for air tightness. Use zinc chloride smoke candles or titanium tetrachloride ampules (sticks) to generate smoke.
 - a. If ducted systems leak, do not continue with air balance. Report findings to Engineer in writing and begin testing again after Mechanical Contractor has repaired ducts or applied duct sealers.
 - b. If ducted systems appear air tight, proceed with air balance procedure as outlined below.
 - c. Include in air balance report a letter indicating smoke testing has been accomplished and a report of findings regarding airtightness of each ducted system.
 - d. Maximum leakage loss shall not exceed 2 percent. If losses are greater, the Mechanical Contractor shall correct the leakage, then the test and balance agency shall retest the ductwork.
3. Test and adjust blower rpm to design requirements.
4. Test and record motor full load amperes.
5. Make Pitot Tube traverse of main supply and return and obtain design cfm.
6. Test and record system static pressures, suction, and discharge.
7. Test and adjust system for design cfm air.
8. Test and adjust system for design cfm outside air.
9. Test and record entering air temperatures (db heating and cooling).
10. Test and record entering air temperatures (wb cooling).
11. Test and record leaving air temperatures (db heating and cooling).
12. Test and record leaving air temperatures (wb cooling).
13. Adjust main supply and return air ducts to proper design cfm.
14. Adjust zones to proper design cfm, supply and return.
15. Test and adjust each diffuser, grille, and register to within 10 percent of design requirements.
16. Identify each diffuser, grille, and register to location and area.
17. Identify and list size, type, and Manufacturer of diffusers, grilles, registers, and testing equipment. Use Manufacturer's rating on equipment to make required calculations.
18. In readings and tests of diffusers, grilles, and registers, include required fpm velocity and test fpm velocity and required cfm and test cfm after adjustments.
19. In cooperation with Mechanical Contractor, set adjustments of automatically operated dampers to operate as specified, indicated, or noted.
20. Adjust diffusers, grilles, and registers to minimize drafts.
21. Verify the calibration of temperature control devices, thermostats, etc.
22. Verify all control sequences with specifications.
23. Include manufacturer's performance data with reports.
24. Schedule inspections to verify original test and balance of systems within 90 days of acceptance by Owner. Make opposite season adjustment and inspection of systems at one year after acceptance by Owner. Submit reports after each inspection. Submit schedule as part of initial report.

B. Where systems supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that system shall have their supply air quantities increased by the ratio of the actual total air quantity supplied to the minimum air quantity required by the schedule.

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C. The TAB agency shall verify that all ductwork, splitters, extractors, dampers, grilles, registers, and diffusers have been installed per design, are functional and set full open. Any leakage in the ductwork shall be repaired prior to the test. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards or NEBB Standards:

1. Fans
 - a. Fan Speeds--Test and adjust fan RPM to achieve design cfm requirements.
 - b. Current and Voltage--Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - c. Pitot-Tube Traverse--Perform pitot-tube traverse of the main exhaust ducts to obtain total CFM. If a pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
 - d. Static Pressure--Test and record system static pressure, including the static pressure profile of each exhaust fan.
2. Zone, Branch, and Main Ducts
 - a. Adjust ducts to within design cfm requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
3. Diffusers, Registers, and Grilles
 - a. Tolerances--Test, adjust, and balance each diffuser, grille, and register to within 10 percent of design requirements. Minimize drafts.
 - b. Identification--Identify the type, location, and size of each grille, diffuser and register. This information shall be recorded on air outlet data sheets.
4. Coils
 - a. Air Temperature--Once air flow are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperature shall be taken on the entering and leaving side of each heating coil.
5. Air Handling Units:
 - a. Location, manufacturer, model number, serial number, motor manufacturer, fan and motor sheaves, belts. Required and test data with unit operating at full air flow conditions (all space thermostats calling for cooling) for each of following: total CFM, return and outside air CFM, total static pressure, suction and discharge static pressures across unit fan, HP, amperage, voltage, fan RPM. Verify performance of static pressure controls, vane operators, dampers and controls. Adjust and/or change pulleys and belts as required to obtain delivery of system specified or required full load air quantities.
6. Control Systems:
 - a. Verify all control sequences and calibration of all thermostats and sensors.
7. Equipment Start-up:
 - a. The Test and Balance Contractor shall be on site to witness and record all factory start-up of mechanical equipment. Include start-up reports in final balancing report.

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3.3 INDOOR AIR QUALITY VERIFICATION:

- A. The TAB agency shall take measurements at minimum outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal and operation and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.
- B. The TAB agency shall prepare a short report showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies.

3.4 ADDITIONAL TAB SERVICES:

A. Job Site Inspections:

During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. The TAB agency shall submit a written report of each inspection to the Architect.

B. Duct Leakage Testing:

The Installing Contractor shall isolate and seal sections of ductwork for testing. The pressurization fan and test apparatus shall be connected to the test section and the test performed. The test pressure required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section.

C. Verification of HVAC Controls:

1. The TAB agency shall be assisted by the building control Systems Contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:
 2. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
 3. Verify that all controlling instruments are calibrated and set for design operating conditions.

D. Temperature Testing:

To verify system control and operation, a series of three temperature tests shall be taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than 2 degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

E. TAB Report Verification:

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At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the Owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10 percent of the total number tabulated in the report.

F. Kitchen Hood Testing:

The TAB agency shall test and adjust kitchen hood total air flow by duct pitot-tube traverse if applicable under local code. If a pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. All sealing of test holes in the exhaust duct to be by others per local code requirements. The TAB agency shall test and record face velocities in accordance with design requirements. It shall test and adjust makeup air flow (if included) to meet design face velocities and pressurization and to minimize turbulence.

G. Building/Zone Pressurization:

The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.

END OF SECTION 25 05 93

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SECTION 23 07 00 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Pipe insulation installation shall not begin until all work has been tested and found to be tight. All insulation shall be UL listed and have a flame spread of less than 25 and a developed smoke rating less than 50. All insulation shall be banded with aluminum bands, three per section. All insulation shall be continuous through walls, floors, ceilings, etc.

PART 2 - MATERIALS

2.1 CONDENSATE DRAIN PIPING

A. Insulate condensate drain piping with 3/4 inch thick closed cell rubber type insulation.

2.2 REFRIGERANT LINES

A. Insulate all refrigerant suction lines with 1 inch thick closed cell rubber insulation. Apply two (2) coats of black mastic where the lines are exposed to the weather. Refrigerant piping below grade shall be installed in watertight PVC sleeve.

2.3 AIR CONDITIONING DUCTWORK

- A. Insulate all ducts above ceiling with one layer of 3 inch thick, 3/4 pound density flexible Fiberglass duct insulation with aluminum foil facing. Duct insulation to be applied with 2 inches lap of facing sealed with tape and outward clinch staples. Seal all joints with 2 inch wide vapor barrier tape. An additional band of tape shall be applied between the circumferential joints for a maximum 2 foot spacing of taped bands.
- B. The ductwrap shall have a minimum installed R-value of 8.5 and shall comply with Energy Code requirements..

2.4 HORIZONTAL WASTE PIPING

A. All horizontal waste lines and traps above first floor slab which receive condensate from air conditioning equipment, roof drain bodies, shall be insulated same with 2 inch thick, 3/4 pound density fiberglass insulation with aluminum foil vapor barrier or closed cell rubber insulation.

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MECHANICAL INSULATION

23 07 00 - 1/2

2.5 KITCHEN HOOD EXHAUST DUCTWORK

A. Refer to Kitchen Hood specifications section.

2.6 INSULATION BANDS

A. All pipe insulation shall be banded with nylon tie-wrap bands, three to a section, and with one band on each side of each fitting, valve, etc.

2.7 FLANGES, VALVES AND FITTINGS

A. All flanges, valves and fittings shall be insulated with fabricated fiberglass molded fitting insulation, using factory fabricated fittings up to 3 inches and fabricated mitered segments of pipe insulation equal in thickness to the insulation to the adjoining pipe. All fabricated mitered segments shall be covered with matching embossed vapor barrier laminate.

PART 3 - INSTALLATION

3.1 Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.

A. Insulation Installation:

1. Do not install covering before piping has been tested and approved.
2. Ensure piping surface is clean and dry prior to installation.
3. Ensure insulation is dry before and during application.
4. Insulation shall be continuous through walls, floors and ceiling. Pack around pipes with fire proof self-supporting insulation material, fully sealed.
5. Insulate fittings and valves. The end of the insulation shall be fitted with a metal escutcheon plate with set screw or taped neatly with pressure sensitive fiberglass reinforcing cloth.
6. All joints shall be sealed with 3 inch wide fiberglass reinforcing cloth with pressure sensitive adhesive.
7. Pipe insulation at Hangers and Supports: Pipe insulation at hanger and support shall be protected with a half circular shield of the size of the insulation and 12 inches long constructed from 20 gauge galvanized steel. The shield shall be held in place with the fiberglass reinforcing cloth and pressure sensitive adhesive. Where pipes pass through walls, ceiling and floor in finished areas, escutcheon plates shall be installed to encompass

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pipe and insulation. Escutcheon plates shall be chromed brass or stainless steel and shall be either solid or the clamp on split type.

8. Painting of fiberglass pipe jacket is not required. Piping shall be painted colors as standard in this facility.

END OF SECTION 23 07 00

MECHANICAL INSULATION

23 07 00 - 2/2

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SECTION 23 09 00 - TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Refer to Section 23 05 00, Section 23 05 03, Section 23 30 00 and Section 23 70 00, provisions of which apply to work under this Section.
- B. All control systems shall be furnished complete and functioning.
- C. Coordinate all control work with the mechanical and electrical contractors. Contact the Test and Balance Contractor and notify them as to when controls work shall be installed. Test and Balance controller shall verify controls systems installation and proper operations.

1.2 DESCRIPTION OF WORK

- A. Provide a complete system of "hard-wired" automatic controls (wireless unacceptable) as indicated herein. Control system shall consist of all thermostats, sensors, actuators, operators, wiring, switches, relays and control panels necessary to accomplish the control sequence specified herein.

1.3 RELATED WORK IN OTHER SECTIONS

- A. For extent of power wiring and connection to mechanical equipment under Electrical Work, refer to Division 26.
- B. For control devices furnished with equipment, refer to equipment specifications and schedules. Any controls equipment not specifically called for elsewhere shall be provided by controls contractor. All control wiring shall be done by controls contractor.
- C. All power for control devices such as actuators, operators, fire/smoke dampers, control dampers, etc. shall be furnished, installed and wired by the Controls Contractor. Controls Contractor may use 24 VAC or 120 VAC for the control system. The controls contractor shall be responsible for obtaining the necessary power and pay all costs associated with obtaining power to controls and controls equipment.
- D. All interior control wiring shall be installed in galvanized EMT conduit. The last 6 inches at connection to equipment shall be flexible metal conduit. All control wiring on exterior of building shall be in Seal-Tite conduit and/ or Liquid Tight flexible conduit.
- E. All control wiring shall be furnished and installed by this contractor.

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1.4 SERVICE

A. Installing Contractor (Mechanical Contractor or subcontractor under the Mechanical Contractor) shall maintain adequate automatic control personnel on his payroll to provide back-up project control service on the automatic control system provided under this contract.

1.5 WARRANTY

A. Contractor shall warranty all work performed under this contract to be free of any defects in workmanship or material for a period of one year after final acceptance by the Owner's representative. The installing controls contractor shall include a second year of extended warranty to cover all parts and labor. The warranty and extended warranty shall include quarterly calibration and set-up checks of all controls. THIS WARRANTY DOES NOT START ON DATE THAT THE MECHANICAL EQUIPMENT IS STARTED.

1.6 SUBMITTAL

- A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.
- B. Submit manufacturer's installation instructions. Instructions shall include complete wiring diagrams drawn specifically for this project.

1.7 OPERATION AND MAINTENANCE

- A. Include manufacturer's descriptive literature, operating instructions, and maintenance data.

1.8 QUALITY ASSURANCE

A. Manufacturer shall be a company specializing in products of the type specified in this section. All components shall be Class A quality commercial or industrial grade for installation in locations or environments shown on plans.

1.9 SYSTEM RESPONSIBILITY

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A. The entire control system, shall be furnished by a single source manufacturer who shall be responsible for the entire system. The installations shall be by technicians employed by the controls system manufacturer.

PART 2 - PRODUCTS

2.1 FIRESTATS AND SMOKE DETECTORS

- A. Duct smoke detectors shall be furnished and installed by mechanical contractor. Install a smoke detector in the supply air section/duct and return air section/ duct of each unit delivering over 2000 cfm to stop the fan and close the outside air dampers in the event of excessive temperature or smoke. Firestats to be provided in the return air units of all units over 600 cfm.
- B. Smoke detectors shall be addressable and compatible with the fire alarm system.
- C. Where and when the building does not have a fire alarm system, provide a remote annunciator with remote reset for each detector.
- D. All smoke detectors shall have remote reset.

2.2 TEMPERATURE CONTROLLER

- A. Refer to Section 23 70 00, Packaged Outside Air Unit for controller.

2.3 WIRING

- A. Factory mount and wire controls. Mount electrical components in control box with removable cover. Provide clearance for access to controls (36 inch clearance).
- B. Provide terminal strip(s) for field wiring of thermostat, communications and power source. DO NOT USE WIRE NUTS IN JUNCTION BOX.
- C. All wiring shall comply with local and national electric codes and the manufacturer's published installation manual.
- D. Provide terminal strip(s) for field wiring of air conditioning unit input connections, duct temperature sensor, velocity sensor, static pressure sensor, communications, start/stop devices, VFD controls, time clock, bypass damper motor and power wiring, etc. Do not use wire nuts on loose wire. All wire shall be in conduit, flexible conduit or wiring harness.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Division 26, ELECTRICAL, shall be responsible for point to point wiring of all starters and starting switches not factory installed in the HVAC equipment.
- B. Install all components of control systems under this Section using experienced control mechanics, all in the regular employ of the Installing Contractor, or the apparatus manufacturer.

3.2 WIRING

- A. Install all control, pilot circuit and interlock wiring, including wiring through interposed safety or other auxiliary control devices within the confines of the mechanical equipment only. Wiring of thermostats shall be by the Mechanical Contractor.
- B. All wiring shall conform to the Local and National Electrical Codes.
- C. All control and interlock wiring shall be fused at conductor capacity as shown in the National Electrical Code.
- D. No splices will be allowed except at junction boxes and control centers.
- E. All wires to each control device must be different colors. All wires to each device must be laced or tied at point of entry into control panel and tagged as to its point of origin.
- F. All wires shall be run directly from controller or controlled device to control center. There shall be no looping of wires from one device to another external to the control centers.
- G. Control voltage shall be a maximum of 120-volt, unless otherwise indicated herein.
- H. Control or interlock wiring shall not be run in conduit with any power wiring other than that serving the equipment controlled.
- I. Refer to Division 26, ELECTRICAL, for extent of work under that Division. Provide other wiring systems required to accomplish the work of this Section, following requirements of Division 26 for products and execution.
- J. Wiring connection to terminal posts shall be made by means of compression type lugs. Wire splices shall be made with sketch locks.

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- K. Safety devices in motor control circuits shall be wired to interrupt the holding coil circuit regardless of the position of any selector switches in the circuit.
- L. Control circuit conductors shall be sized for a maximum voltage drop of 10 percent of the circuit voltage.
- M. All electrical power wiring shall conform in all respects with the provisions of the National Electrical Code and Division 26, ELECTRICAL, of the Specifications.
- N. Provide all necessary contactors, switches, transformers to accomplish operating sequences.

3.3 SYSTEM CHECK-OUT

- A. Check-out each system for control function through entire sequence, check calibration of instruments, reset instruments control points.
- B. Owner maintenance personnel shall be made thoroughly familiar, by the contractor, with the operation and service of the project automatic temperature control circuits.

3.4 SOFTWARE FOR CONTROLS SYSTEMS

- A. All software required for the operation of the temperature control system shall be furnished with the control system. The temperature controls manufacturer/contractor shall furnish the software plus two years of software updates.
- B. The software shall be provided in original sealed packaging with all written/printed documentation to the Test and Balance Contractor for use in balancing the project. The temperature controls contractor shall turn the software over to the owner upon completion of the project.

END OF SECTION 23 09 00

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SECTION 23 28 13 - COMMERCIAL KITCHEN HOODS

PART 1 - GENERAL

1.1 GENERAL

A. The General Section the Mechanical Specification is a part of the Commercial Kitchen Hood Specification and applies same as if herein specified.

1.2 SCOPE OF WORK

A. Furnish and install all materials, labor, tools, equipment and working plans as required to install and place in operation the complete Kitchen Hood System.

1.3 WORK INCLUDED

A. The work shall include but not be limited to the following:

1. All exhaust/make-up air ductwork
2. Fan packages
3. Kitchen hoods (Existing)
4. Insulation and controls

1.4 PLANS AND DIAGRAM

A. Working plans (drawings) shall be prepared by the contractor before commencing hood installation. The working drawings (plans) shall be detailed and submitted by the contractor to the following for approval:

1. State Fire Marshal/AHJ

B. Drawings must first be submitted to the Mechanical Engineer (POR) for approval. POR will then forward the plans to the State Fire Marshal/AHJ. Drawings must be submitted in conjunction with hood Fire Suppression Drawings. Refer to the State Fire Marshal's website for all fees, checklists, forms and requirements for submittal.

1.5 PERMITS, INSPECTIONS AND TESTS

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- A. All permits, fees, etc., for the installation, inspection, review or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the contractor.
- B. All inspections, examinations and tests required shall be arranged and paid for by the contractor as necessary to obtain complete and final acceptance.

PART 2 - MATERIALS

2.1 KITCHEN HOOD EXHAUST DUCTWORK

- A. All kitchen hood exhaust ductwork shall be constructed of 16 gauge black iron with weld seams and joints. All seams and joints shall be liquid tight. All construction of ductwork shall be in compliance with NFPA 96.
- B. Cover the kitchen exhaust with a flexible wrap system listed and labeled (labeling on scrim shall include product name and certification mark) by a NRTL, Nationally Recognized Testing Laboratory. System shall be tested per internal fire test ASTM E 2336 and per ASTM E 119 engulfment test and achieve a 2 hour fire resistance rating. Wrap system shall be fully encapsulated to resist moisture absorption. System shall provide zero clearance to combustible protection at all locations on the system surface. Access doors shall be installed per the manufacturer's instructions to comply with local code. A listed and labeled firestop system must be available to seal the opening where the protected grease duct penetrates a fire rated floor or wall. The field applied grease duct enclosure system must be mechanically attached to the duct using steel banding and/or weld pins per manufacturer's instructions. System shall be NFPA 96 approved. Material shall be Unifrax FryeWrap® Elite® 1.5 3M Fire Barrier 615+ or prior approved equivalent.

2.2 KITCHEN HOOD FAN PACKAGE

- A. Provide roof top pre-engineered exhaust and supply fan package(s) in sizes and quantities as shown on plans. The fan packages shall be a complete system manufactured and assembled by Greenheck, (Accurex), **Captive-Aire and Loren Cook** or prior approved equal.
- B. **Paragraph deleted in it's entirety.**
- C. The supply fan unit shall be of the belt-driven, double width, double inlet, forward curved centrifugal blower type. The blower assembly shall be mounted on vibration isolators. Drives shall be sized for a minimum of 165 percent of driven horsepower. All exterior housing components of the supply unit shall be constructed of minimum 18 gauge galvanized steel, painted with a weatherproof finish that has been baked for durability. Heavy gauge adjustable angle iron support legs shall be furnished as required. The inlet of the unit shall contain bird screen and a bank of washable, removable air filters. Filters shall

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be of 1 inch aluminum mesh type, coated with filter adhesive compound and shall be U.L. Classified. The total fan package shall be furnished with a pre-wired control center which shall include, but not be limited to, a master-fused disconnect for main power. Connection, magnetic motor starters with thermal overloads and manual reset, fused 24-volt control transformer and distribution terminal strip for control wiring connection. All electrical components shall be U.L. Listed, Approved or Classified where applicable and wired in compliance with the National Electrical Code. Wiring shall be complete, requiring only one-point field connection for power service (exception: electric heater) and one-point field connection for low-voltage control harness.

- D. Furnish motorized backdraft damper as integral part of supply unit. Damper unit shall open upon energization of supply fan and close upon shut-off of supply fan.
- E. Furnish pre-fabricated roof curbs constructed of minimum 18 gauge galvanized steel with integral wood nailing, run-off cant and 1 inch rigid insulation. Provide curb extensions as required for exhaust fan to meet N.F.P.A. requirements for discharge height.

2.3 KITCHEN HOOD

- A. Kitchen exhaust hoods are existing. Installation of existing hoods shall be by Mechanical Contractor. Furnish all hangers and stainless steel wrappers for a complete installation.
- B. Back supply plenum shall be furnished and installed by the Mechanical Contractor. Plenum shall be 6 inches deep and shall extend the entire length of the hood discharging above the floor. Plenum shall be stainless steel, constructed to meet the proper clearance to limited combustibles per NFPA.
- C. Contractor shall submit hood shop drawings along with hood suppression system for submittal to the Fire Marshal. Contractor shall obtain a copy of the required checklist for all requirements and shall pay all fees required.

2.4 FIRE PROTECTION SYSTEM - KITCHEN HOODS

A. GENERAL

- 1. The General Section of the Mechanical Specifications is a part of the Fire Protection System Specification and applies same as if herein included.

B. SCOPE OF WORK

- 1. Furnish all materials, labor, tools, equipment and working plans to install and place in operation the complete Hood Fire Protection System for the kitchen

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hood as herein specified. The contractor shall be responsible for preparing the plans, calculations, fees and Fire Marshal review of the system layout.

C. WORK INCLUDED

1. The work shall include providing hood fire protection system and shall include but not be limited to the following: all piping and fittings; automatic systems; alarm system; testing and approval; and service fees and installation cost.

D. PLAN AND DIAGRAM

1. Working plans (drawings) shall be prepared by the contractor before commencing fire protection installation. The working drawings (plans) shall be detailed and submitted by the contractor to the following for approval:
 - a. State Fire Marshal.

E. HOOD FIRE PROTECTION SYSTEM

1. Furnish and install a fire protection system for the commercial type cooking hood as listed in these specs. The system shall be installed to meet the requirements of NFPA 96, NFPA 17A and UL 300. The Installing Contractor shall also prepare shop drawings for submittal to the State Fire Marshal for review. The Installing Contractor shall be responsible for paying all fees required for submittal to the state and local review agencies. The system shall be installed by all licensed hood fire protection contractor. The Installing Contractor shall be responsible for providing all certificates for Owner's records. The Installing Contractor shall make two (2) inspections of the system during the first year after acceptance by the Owner.
2. The fire protection system shall utilize a wet type fire suppression agent. The liquid agent shall be a potassium carbonate-based solution designed to suppress fires by its saponifying and cooling effects. The agent shall not require periodic replacement. For rapid fire knockdown, the agent shall have an expansion ratio of approximately 2200 to 1. It shall not have an adverse effect on stainless steel appliance, hoods and ducts.
3. The cylinder shall be manufactured and tested in accordance with DOT specifications. It shall be under coated with zinc chromate or red oxide and over coated with white high gloss enamel. The cylinder shall be pressurized to 175 psi to ensure rapid discharge at temperatures as low as 1 degree Fahrenheit. A highly polished metal enclosure shall be provided to conceal the cylinder.
4. The valve shall be heavy duty forged brass, chrome-plated. It shall incorporate an oil-filled bourdon tube gauge to indicate cylinder pressure.
5. The nozzles shall be heavy duty brass, chrome-plated. It shall incorporate a stainless steel strainer to remove scale and foreign matter from pipe or stainless steel tubing. A pure tin foil seal shall protect the nozzle orifice from grease build up. This seal shall be kept tightly in position by a threaded nut to ensure its permanence through the continuous heating-cooling cycle.

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6. The system shall be designed for automatic operation with provision for remote and/or local manual control(s). Automatic operation shall be initiated by fusible metallic links, glass bulb links, or electric detectors. The links and glass bulbs are to be utilized with stainless steel cable and corner pulleys employing stainless steel ball bearings. All cable and wiring shall be enclosed in conduit. Where used, the electric detectors are to be utilized with a control panel and an electro-thermal link that are UL listed for use with the system. All electrical work shall comply with the National Electric Code.
7. Where gas-fired appliances exist, a gas shut-off valve of either the mechanical or electrical type shall be automatically closed upon system actuation. The mechanical type shall be shut-off through the mechanical actuator or a pneumatic release installed in the discharge line. The electric type shall be wired through a manual reset relay to either micro-switch or pressure switch wired through a magnetic contactor. All work shall comply with the National Electric Code.
8. Pipe shall be black steel, stainless steel, or brass standard weight (Schedule 40). Fittings shall be malleable, ductile, or cast iron, steel, stainless steel, or brass and may be standard weight. Stainless steel tubing incorporating bends or stainless steel fittings may also be used. Fittings may be chrome-plated and piping chromeplated or sleeved. All pipe runs shall be rigidly secured with suitable straps or hangers. Wherever possible, multiple cylinder systems shall be manifolded to minimize pipe.
9. The system shall be installed by an authorized factory trained contractor. The Installing Contractor shall visit the project to take all field measurements and verify the conditions. The Installing Contractor shall acquire and submit all plans, permits and approvals necessary for proper installation and final acceptance. Upon completion, the Installing Contractor shall conduct any and all tests required. The installation shall comply with the manufacturer's installation manual, Underwriters Laboratories listing, National Fire Protection Association Pamphlets 96 and 17A and all applicable regulatory and insurance requirements.

PART 3 - INSTALLATION

3.1 DUCTS

- A. Refer to specification section 23 30 00 for any additional comments regarding general duct construction or layout.

PART 4 - EXECUTION

4.1 INSTALLATION

- A. The Installing Contractor shall install to meet the manufacturer's instructions.

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END OF SECTION 23 28 13

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SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 GENERAL

A. Furnish and install all ducts for Air Conditioning, Heating, and Ventilating Systems as shown on the plans and as may be required to provide complete system. Ductwork shall be complete with grilles, vanes, flashings, hangers, flexible connections, splitters, manual dampers, fresh air inlets, louvers, reinforcing angles, etc. All ductwork shall be concealed and insulated as hereinafter specified.

1.2 COORDINATION

A. The General Contractor and Mechanical Contractor shall coordinate the space clearances required for ductwork with the structure, ceilings, lights, sprinklers, etc. In some cases, due to space limitations, it may be necessary to re-size ductwork to meet the conditions of the project. Any re-sizing required shall be part of this project and done without any additional cost to the project. DO NOT MAKE DUCTWORK WITHOUT COORDINATION.

1.3 DUCTWORK SHOP DRAWINGS

A. The Mechanical Contractor/ Sheetmetal Contractor shall prepare complete sheetmetal ductwork shop drawings showing coordination with all trades on the project. The shop drawings shall show all offsets, transitions, size changes to resolve conflict, dampers, fire dampers, grilles, air units, etc. These shop drawings shall be submitted prior to starting work and ductwork fabrication.

1.4 Sealing or flashing the building envelope due to penetrations in the building shall be the responsibility of the general contractor.

PART 2 - MATERIALS

2.1 DUCT HANGERS AND SUPPORTS

A. All ductwork shall be properly braced to prevent rattling, breathing, or other unnecessary noise. No sharp edges or obstructions shall project into air stream.

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2.2 LOW PRESSURE DUCTWORK

A. All ductwork shall be galvanized steel and shall be of gauges and construction as recommended by ASHRAE Guide and Data Book and SMACNA guidelines. Gauges are as follows with longest side governing.

longest side	Dimension of Low Pressure Ductwork	
		Sheet Metal Gauge
0"-12"		26 gauge
13"-30"		24 gauge
31"-54"		22 gauge
55"-84"		20 gauge

B. Low pressure ductwork shall be all exhaust ducts, return air ducts, fresh air ducts and supply ducts.

C. Joints and reinforcing shall be as per ASHRAE Guide and Data Book and all slips shall be installed without edge of internal part of slip facing downstream.

D. Construction standard of Article 110, of the National Board of Fire Underwriters Bulletin 90, latest edition, shall apply throughout.

E. Flashings shall be of sheet copper and shall be furnished and installed around all outside openings used for ducts of fans and wherever required. Roof flashings shall extend at least 8 inches above roof.

F. All ducts shall be straight and true and installed in a neat and workmanlike manner.

G. All edges shall be straight and true and all bends shall be made with veined turns. Where long radius turns cannot be used, the contractor shall use square turns and use air splitters spaced not more than 3 inches center to center, and of a length so air will be properly distributed over ducts.

H. All ducts shown are metal to metal dimensions.

I. Mastic shall be applied to both male and female connections (all seams and joints) to make all duct joints air tight (applies to all ductwork; round or rectangular). Surplus mastic shall be removed. Tape and re-mastic joints if necessary. Mastic (hard-cast or equivalent duct sealer : tape not acceptable) shall be applied to the joints during assembly so that sealant is on all mating surfaces of the joint.

2.3 DUCT LINERS

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A. Low pressure rectangular supply ductwork shall not be lined. All supply and return air ductwork shall be wrapped with same insulation as specified for round ductwork.
Exhaust ductwork shall not be insulated. **LINED DUCTWORK IS NOT PERMITTED IN THIS PROJECT. WRAP ALL DUCTWORK.**

2.4 FILTERS--PRIMARY

- A. Units shall be equipped with low velocity filter section with 30 percent efficient 2 inches thick pleated type (Continental air filters "cono pleat" FARR 3030, American Air Filter or equal) throwaway filters.
- B. Provide and install one set of filters as called for in these Specifications for initial testing and start-up and another complete set upon completion of the project.

2.5 DUCT ACCESSORIES

- A. Dampers of the fusible link operated type shall be provided in all ductwork passing through floor or fire walls.
- B. Provide quadrant or adjustable splitters and mark shaft to give position of splitter damper in duct.
- C. Provide vanes behind every supply grille or diffuser. Splitters shall be provided where shown on plans and where located in concealed non-accessible space provided Young Regulators to operate splitter. Vanes shall be Tuttle and Bailey "Ducturns", BarberColeman, Uniflo, or equivalent. Shop fabricated vanes will be acceptable. All dampers shall be constructed of 14 gauge steel.

2.6 REGISTERS, GRILLES AND DIFFUSERS

- A. Ceiling supply outlets, unless otherwise indicated on plans shall be Titus, Price, Nailor, **Metalaire** or approved equal. Outlets shall be mounted tight to the construction, and shall have frame suitable for type of ceiling used unless otherwise noted.
- B. Return air grilles shall be as manufactured by Titus, Price, Nailor, **Metalaire** or approved equivalent and shall be of style called for on plans.
- C. All supply outlets shall have sponge rubber gaskets.
- D. All grilles, diffusers, and registers shall be of sizes indicated on plans or scheduled on drawings.
- E. Unless otherwise shown on drawings, all grilles installed in the ceiling shall be furnished with white baked-on enamel finish.

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2.7 FIRE DAMPERS

- A. Furnish and install, at locations shown on plans, fire dampers constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1-1/2 hour fire protection rating, 212 degrees Fahrenheit fusible link, and shall include a UL label in accordance with established UL labeling procedures. Damper manufacturer's literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with AMCA Standard 500 and shall illustrate pressure drops for all sizes of dampers required at all anticipated air flow rates. Fire dampers shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials, and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer's instructions. Fire dampers shall be Ruskin type IBD, Arrow, Cesco, Pref-Co, or equal.
- B. Fire dampers installed within 10 feet of the air handling unit or where velocities exceed 2000 fpm. Dampers shall be static type for systems with duct smoke detectors, dynamic for systems without duct detector fan shut down.
 - 1. Furnish and install at locations within 10 feet of the air handling unit multi blade fire dampers constructed and tested in accordance with UL safety standard 555 (dynamic) that meet or exceed the following specifications:
 - a. Frame shall be a minimum of 16 gauge galvanized (1.52) steel formed into a structural hat and tabbed with tabbed corners for reinforcement. The blades shall be air foil-shaped double skin with 14 gauge (1.90) equivalent thickness. Bearing shall be stainless steel sleeve turning in an extruded hole in the frame.
 - b. Each fire damper shall have a 1-1/2 hour fire protected rating, 212 degree fusible link and shall include a UL label in accordance with established labeling procedure.
 - c. Damper manufacturers' literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with the UL 555 standard.
 - d. Fire dampers shall have been tested to close under dynamic air flow conditions with pressures up to 4 inches w.g. and to 4,000 fpm air velocity.
 - e. Fire dampers shall be equipped for vertical or horizontal installation as required by location shown.
 - f. Fire dampers shall be installed in a wall or floor opening using steel sleeves, angles and other materials and practices required to provide an installation equivalent used by manufacturer when damper was tested at UL. Installation shall be in accordance with the damper manufacturers' instructions.
 - C. Fire dampers installed beyond 10 feet of the air handling unit and where velocities are under 2000 fpm.

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1. Furnish and install at locations shown on plan fire dampers constructed and tested in accordance with UL safety standard 555.
 - a. Fire dampers shall have been tested to close under dynamic air flow conditions and be labeled as a dynamic fire damper (static fire dampers are not allowed).
 - b. Each fire damper shall have a 1-1/2 hour fire protected rating, 212 degree fusible link and shall include a UL label in this specification accordance with UL 555 standards, and a dynamic label that shall illustrate maximum allowable cfm at 8 inches static pressure for in-duct mounted and maximum allowable cfm at 8 inches static pressure for in-duct mounted and maximum allowable at 4 inches static pressure for un-ducted, in-wall mounting.
 - c. Fire dampers shall be equipped for vertical or horizontal installation as required by location shown.
 - d. Fire dampers shall be installed in wall and floor openings using steel sleeves, angles and other materials and practices required to provide an installation equivalent to that used by the manufacturer when dampers were tested at UL. Installation shall be in accordance with damper manufacturers' instructions.

D. Round fire dampers: All systems with pressures to 6 inches w.q. and velocities to 4000 fpm.

1. Furnish and install at locations shown on plans, or as described in schedules, round fire dampers meeting or exceeding the following specifications.
 - a. Frame shall be a minimum of 20 gauge galvanized steel and blade shall be two piece equivalent to 14 gauge minimum galvanized. Bearings shall be stainless steel sleeve with grooves to receive the 20 gauge retaining plate for damper mounting.
 - b. Each round fire damper shall be 1-1/2 hour fire rated under UL standard 555, and bear a UL label attesting to same.
 - c. Each round fire damper shall be equipped with a Fuse Link which shall activate at (specifier select one) 165 degrees, 212 degrees, causing damper to close in a locked position.
 - d. Manufacturer must provide UL installation instructions for both masonry walls and metal stud drywall partitions.

2.8 PRE-INSULATED FLEXIBLE DUCT

A. Flexible duct shall be rated for a maximum pressure of 16 inches (4-10 inches I.D.) or 10 inches (12-16 inches I.D.) water column positive pressure and 2 inches water column maximum negative pressure and 6000 FPM maximum velocity and listed by Underwriters Laboratories, Inc. under UL Standard 181 as a Class 1 air duct complying with NFPA Standards 90A and 90B. Flexible air duct shall be factory-made and composed of an inner duct of woven and coated fiber glass fabric providing an air seal

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and permanently bonded to coated steel wire helix, a fiber glass insulating blanket with minimum R-8.0 value (minimum 2 inch thickness) and low permeability outer vapor barrier of fiberglass reinforced metalized film laminate. Flexible air ducts shall be Thermaflex Everclean or Flexmaster type 4M with minimum R-8.0 insulation to meet ASHRAE 90.1 energy code. Maximum installed length shall not exceed 3 feet-0 inches without approval.

PART 3 - INSTALLATION

3.1 DUCTS

A. Ductwork shall be constructed and installed as follows:

1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
2. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inches or bead 12 inches on center.
4. Securely anchor ducts to building structure with specified duct hangers attached with screws.
5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
6. Ducts shall not bear on the top of structural member.
7. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
8. Properly flash where ducts protrude above roof.
9. Install internal ends of slip joints in direction of flow. Make joints air tight using specified duct sealer.

B. Install flexible duct connections to each air handling unit.

C. Provide each take-off with an adjustable volume damper to balance that branch.

1. Anchor dampers securely to duct.
2. Install dampers in main ducts within insulation.
3. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened.
4. Where concealed ceiling damper regulators are installed, provide a cover plate.

D. Install grilles, registers, and diffusers.

3.2 AIR TURNS

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- A. Permanently installed, consisting of curved metal blades or vanes arranged to permit air to make abrupt turn without appreciable turbulence, in elbows of supply and above ground return ductwork.
- B. Air turns shall be quiet and free from vibration when system is in operation.

END OF SECTION 23 30 00

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SECTION 23 70 00 - AIR CONDITIONING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Air Conditioning System, in general, shall be for the entire building providing cooling and dehumidification in summer and heating in winter. A constant amount of fresh air shall be taken into the system and all air shall be filtered.
- B. The General Contractor (Prime Contractor) who has the contracts with the Owner shall be responsible for installing the mechanical systems using qualified subcontractors and/or employees. Any incorrect or improper work shall be corrected by the General Contractor.
- C. The General Contractor shall be the sole source responsible party to furnish and install the mechanical system. General Contractor shall be properly licensed to perform this work.

1.2 STANDARDS

- A. All air conditioning equipment shall comply with the requirements of applicable ARI standards and shall be tested, rated, labeled, and listed accordingly.

1.3 SPACE REQUIREMENTS

- A. General Contractor and Mechanical Contractor shall refer to architectural, structural and electrical drawings and install all equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit into the space provided or coordinate with other trades involved on the project.

1.4 COMPRESSOR WARRANTIES

- A. On all packaged and/or split system DX equipment 6 tons and larger, the manufacturer shall provide a full 5 year labor and material warranty for any and all compressor failures during the warranty period. This warranty is for labor, materials and refrigerant for the compressor replacement.
- B. The manufacturer shall warranty all parts, labor and refrigerant systems on the entire unit for the warranty period. In addition, annually, the manufacturer's service technicians shall make a warranty check inspection of the unit with report to the Owner. This warranty shall not include any equipment maintenance; all equipment maintenance is the responsibility of the Owner. The manufacturer shall have full access to the units during the construction period.

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C. If a longer warranty period is required elsewhere in these specs, the longer warranty period shall apply.

PART 2 - MATERIALS

2.1 PIPING

A. All piping shall be of materials as hereinbefore specified.

2.2 PACKAGED OUTSIDE AIR UNIT (100% OUTSIDE AIR)

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary airconditioning and heat pump equipment.

1. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.
2. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.
3. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.
4. Unit Energy Efficiency Ratio (EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.
5. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.
6. Unit shall be approved for use in and outside High Velocity Hurricane Zones (HVHZ) by the Florida Building Code (FL# 15031), when using the required steel rooftop curb and attachment methods. Maximum allowable lateral wind pressure is +100psf/-100psf. Maximum allowable uplift is +50psf/-50psf. Positive and negative required design pressures calculated for use with this system shall be determined by others on a job specific basis, in accordance with the governing code. Site specific pressures shall be less than or equal to the listed positive or negative allowable lateral wind design pressure and allowable uplift values for the product.

B. Manufacturer shall provide a limited "parts only" warranty for a period of 24 months from the date of equipment startup or 30 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for Installation, Operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters.

C. Products shall be provided by the following manufacturers:

1. AAON, Addison or approved Equal

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2. Substitute equipment may be considered for approval that includes at a minimum:

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- a. R-410A refrigerant
- b. Variable capacity compressor with 10-100% capacity control
- c. Direct drive supply fans
- d. Double wall cabinet construction
- e. Insulation with a minimum R-value of 13
- f. Stainless steel drain pans
- g. Hinged access doors with lockable handles
- h. All other provisions of the specifications must be satisfactorily addressed

D. General Description

- 1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, gas heaters, and unit controls.
- 2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
- 3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
- 4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
- 5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
- 6. Installation, Operation, and Maintenance manual shall be supplied within the unit.
- 7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
- 8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

E. Construction

- 1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
- 2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
- 3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

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4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coils, reheat coil, heaters, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.
11. Unit base pan shall be provided with 1/2 inch thick foam insulation.

F. Electrical

1. Unit shall be provided with factory installed and factory wired, fused disconnect switch.
2. Unit shall be provided with a factory installed and factory wired 115V, 13 amp GFI outlet disconnect switch in the unit control panel.

G. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

H. Cooling Coils

1. Evaporator Coils
 - a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
 - b. Coils shall have interlaced circuitry and shall be 6 row high capacity.

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- c. Coils shall be hydrogen or helium leak tested.
- d. Coils shall be furnished with factory installed expansion valves.

I. Refrigeration System

- 1. Unit shall be factory charged with R-410A refrigerant.
- 2. Compressors shall be scroll type with thermal overload protection and carry a 10 year non-prorated warranty, from the date of original equipment shipment from the factory.
- 3. Compressors shall be mounted in an isolated service compartment which can be

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accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.

- 4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
- 5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
- 6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
- 7. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.
- 8. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
- 9. Each refrigeration circuit shall be equipped with a liquid line sight glass.
- 10. Each refrigeration circuit shall be equipped with suction and discharge compressor isolation valves.

J. Condensers

- 1. Air-Cooled Condenser
 - a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
 - b. Coils shall be designed for use with R-410A refrigerant. Coils shall be multipass and fabricated from aluminum microchannel tubes.
 - c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
 - d. Coils shall be hydrogen or helium leak tested.
 - e. Condenser fans shall be high efficiency electrically commutated motor driven with factory installed head pressure control module. Condenser airflow shall

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continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

K. Gas Heating

1. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.
2. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.
3. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.

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5. Natural gas furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment.

L. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.
2. Unit shall include 1 inch aluminum mesh pre filters upstream of the outside air opening.

M. Outside Air/Economizer

1. Unit shall include 100% motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return, 2 position actuator. Unit shall include outside air opening bird screen and outside air hood.

N. Controls

1. Factory Installed and Factory Provided Controller
 - a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of standalone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
 - b. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
 - c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
 - d. Makeup Air Controller
 - 1) Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.
 - 2) With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet outside air humidity loads and prevent supply air temperature swings and overcooling of the space.

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- 3) Unit shall modulate heating with constant airflow to meet ventilation outside air loads. Heating capacity shall modulate based on supply air temperature.
- e. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network.

O. Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

P. Installation, Operation, and Maintenance manual shall be supplied with the unit. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation, and Maintenance manual instructions. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install air conditioning systems in accordance with Section 23 05 00.
- B. Mount equipment complete with piping system, roof curbs and air distribution system, and provide for power connection.
- C. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

3.2 TESTING

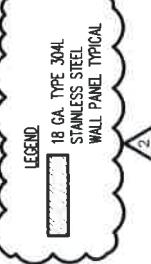
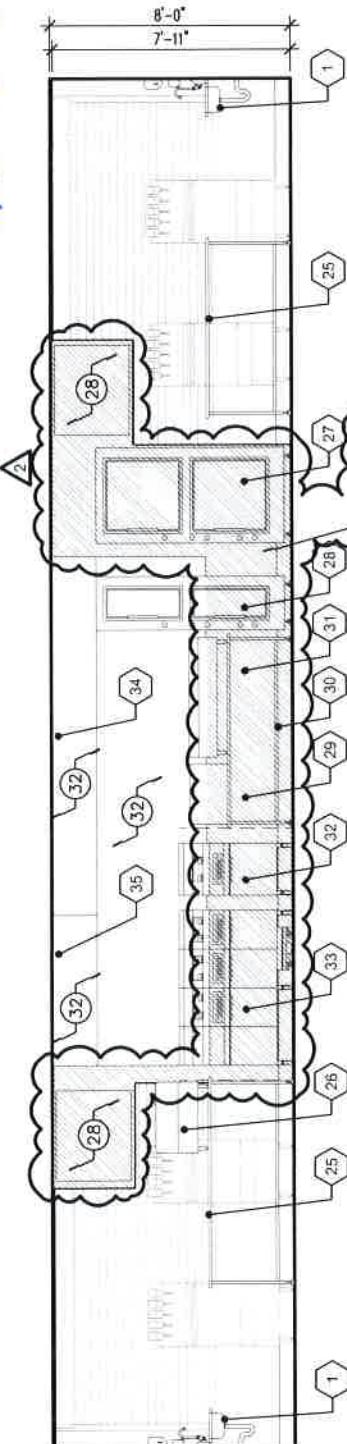
- A. Refrigerant lines shall be tested under 200 psi carbon dioxide pressure for 5 hours using soap suds at joints to test for leaks. Evacuate system and charge with refrigerant.
- B. All line testing shall be witnessed by the Test and Balance Agency (TAB). TAB Agency shall record results and include in final TAB report.

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END OF SECTION 23 70 00



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INTERIOR ELEVATION
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SCALE: N.T.S.