1.1 **INTENT**

The State of Alabama, Information Services Division hereinafter referred to as "the STATE" desires to purchase HVAC equipment, installation, and maintenance as described in this bid. The following terms and conditions apply to this arrangement:

1.2 **RESPONSE PREPARATION AND BID FORMAT:**

A. Any bidder submitting a response stipulates that they have read, understand and will comply with all provisions of this ITB.

B. **Requirements containing the words must, shall, and will are considered mandatory.**

C. **The bidder must complete the following in order to comply with the bid:**

**BID RESPONSE**

1. The bid response must include the following information exactly as described within the body of the bid:

   i. Complete product information, including technical and descriptive literature

   ii. A description of the equipment configuration and associated capabilities and any applicable environmental requirements/considerations/constraints (for example if the STATE is required to make any modifications to the specified area, the bidder must clearly identify modifications with their bid)

   iii. Letter of certification (See 1.17)

   iv. Reference information (See 1.16)

   v. Copies of the bid (See 1.6)

   vi. Completed price sheet (STATE's bid price sheet; See 1.9 & Section II)

   vii. Completed Table B – Hardware maintenance (5 years) price sheet (See 1.12 & Section II)

   viii. Any other requirements set forth elsewhere in the bid.

2. Information submitted must be sufficiently detailed to substantiate that the products offered meet or exceed the specifications.

3. Any additional information requested from a bidder must be furnished within ten calendar days from receipt of request.

**FURNISH 10 DAYS AFTER NOTIFICATION OF AWARD**

1. Contact information for trouble reporting (See 1.12)
2. Management contact information (See 1.12)
3. Performance Guarantee (See 1.11)

**FURNISH UPON COMPLETION OF BID REQUIREMENTS**

1. Written notification of completion (See 1.10)
2. As-built drawings (1.6 Section L)

1.3 Upon release of this ITB, all bidder communications concerning this procurement must be directed to the Division of Purchasing. ***Any contact*** regarding the ITB with other State employees may result in disqualification. Questions that arise concerning the ITB must be submitted via email to:

Ray Bressler, Buyer
State of Alabama
Department of Finance
Purchasing Division
Ray.bressler@purchasing.alabama.gov
cc: valisha.kirkland@isd.alabama.gov

1.4 Questions must be received emailed. ***No telephone calls and no personal contact with regard to the ITB*** will be accepted anytime.

1.5 **SITE SURVEY** Bidders must make a site survey to qualify to bid this project. If a bidder has already made the survey within the last 90 days, they will not have to make a second visit. The site visit will be scheduled for a specific date. Bidders must contact Valisha Kirkland via email at Valisha.kirkland@isd.alabama.gov to attend the site survey.

1.6 **RESPONSE SUBMISSIONS:**

A. Bidders must provide a minimum of three (3) copies of the bid (original and two complete copies) with the bid response which presents ALL PRICING DATA clearly and completely.

B. The STATE is not liable for any cost incurred by a bidder replying to this ITB.

1.7 **BID AWARDS:**

A. The STATE will award a contract for purchase only.

1.8 **DELIVERY:**

A. All items listed in the ITB specifications must be delivered no later than 30 days after receipt of order.

1.9 **INSTALLATION:**

A. Installation must be completed by personnel authorized by the equipment manufacturer.

B. The bid must include pricing for installation – on STATE's bid price sheet. Installation shall include delivery, setup, connection, debris removal, and testing; and upon successful completion, turnover of the equipment/system to the designated representative of the STATE. Maintenance period for all items delivered and accepted shall begin on the first day after acceptance by the STATE. All support equipment, cables, features, software, etc. required for installation must be shipped with or prior to the equipment and as specified in delivery paragraph.

1.10 **STANDARD OF ACCEPTANCE:**

A. The awarded bidder shall identify in writing to the STATE when the equipment is installed and ready for use at which time operational control becomes the responsibility of the STATE.

1.11 **PERFORMANCE GUARANTEE:**

A. Upon award, the bidder(s) will be required to provide to State Purchasing, within ten working days of notification of award, a performance guarantee, approved by the STATE, of an amount equal to fifty percent (50%) of the bid total as a guarantee for the delivery, installation and acceptance of the equipment in accordance with the specifications and as warranty that the products they were awarded meet all the performance standards and criteria established by the respective manufacturer's products or if the equipment fails to meet the manufacturer's standards and criteria, the contracting authorities for the STATE reserve the right to proceed against the performance guarantee and to cancel any purchase orders and any associated agreements without any resulting liability, present and future, to the STATE.

B. The performance guarantee referenced above must remain in place through delivery and acceptance by the STATE.

C. The awarded vendor will be held responsible for the actions of their employees while on State of Alabama property. While on State of Alabama property, the vendor's employees will conduct themselves in a courteous, professional manner, adhere to all State and Federal laws, and follow the directions of the STATE contact. These include but are not limited to, (1) no vendor employee

shall enter the STATE site in possession of any type of firearm or other weapon, (2) no vendor employee shall enter the STATE site under the influence of, or in possession of, alcohol or any illegal drug or controlled substance, and (3) all vendor employees and vehicles entering State of Alabama property or coming in contact with State of Alabama employees are properly licensed, insured, and operated according to Alabama state law.

D. The vendor's representatives must have a photo ID visible (Issued by the STATE) at all times when on State of Alabama property.

E. The vendor will be the single point of contact for all matters 24 hours a day, 7 days a week. This includes sub contractors, manufacturers, and employees. The vendor will provide one telephone number to contact. If the call is not local to Montgomery, the vendor will provide a toll free number at no cost to the STATE.

1.12 **EQUIPMENT MAINTENANCE:**

A. The bidder must bid the appropriate level of maintenance as specified in this paragraph associated with the commodity line being bid.

B. Bid response must include maintenance pricing for five (5) years (Table B).

C. It will be at the STATE's option to renew maintenance each year up to five years.

D. Equipment maintenance will be billed and paid monthly in arrears.

E. The bidder must provide and keep current within ten days of award a central number for the STATE to make trouble reports.

F. Bidder must provide on-site maintenance during normal business hours Monday through Friday (8-5) excluding holidays. The Bidder will provide a qualified technician within two hours of call.

G. The Bidder must provide replacement parts within 24 hours of diagnosis of any problem.

H. Bidder must also provide within ten days and keep current for the duration of the contract, the name and contact phone number of management personnel responsible for resolving any and all problems pertaining that may occur needing management involvement.

1.13 **CRITERIA FOR SELECTION:**

A. Bid will be awarded to lowest priced compliant bidder.

1.14 **ADDITIONAL INFORMATION AND COMMENTS:**

A. The Bidder's response should include any additional information that is believed to be pertinent but not explicitly asked for elsewhere in this ITB.

1.15 **SITE ASSISTANCE:**

A. The Bidder's response should include, but be not be limited to, site preparation requirements and assistance that will be provided to the STATE in implementing and operating the equipment.

B. The bidder must provide within ten days of, the necessary documentation and ongoing assistance for physical planning, power determination and requirements, environment requirements, and any other operating constraints required for the successful installation, operation, and service of the equipment.

1.16 **RELATED EXPERIENCE:**

A. The bidder must identify three customers currently using the items (of the manufacturer bid) and services of the type offered in the bid.

B. The equipment must have been operational for a minimum period of six (6) months.

C. A name, title, address and telephone number must be provided for a person to contact, willing to serve as a reference regarding the items bid.

D. The STATE will only make three attempts to contact references. If the STATE cannot contact a reference in three attempts, over a period of at least three business days, the STATE reserves the right to reject the bid.

1.17 **CERTIFICATIONS**

A. The bidder must provide proof of certification with their bid response that the bidder, their employees, contractors, or agents are certified to sell, install and maintain all major components from the manufacturer. This must include the following:

- The letter of certification must be on manufacturer letterhead
- The letter of certification must be signed and dated

- The letter of certification must include the printed name and contact number of the person signing the letter.

- The letter of certification must state that the bidder is certified to sell, install, and maintain the manufacturer's equipment.

**SECTION 15010 - MECHANICAL GENERAL**

PART 1 - GENERAL

**1.1 RELATED DOCUMENTS:**

A. The "General Conditions", "Supplementary Conditions", Statutory Declarations, Special Conditions and Division 1 of the specifications as written and referred to are adopted and made part of Division 15.

**1.2 DESCRIPTION OF WORK:**

A. Provide equipment, labor, material, etc., required to make a complete working installation as shown or as specified.

B. Equipment and materials used in the work shall be:

1. In accordance with the contract documents.
2. The best quality and grade for the use intended.
3. New and unused.
4. The manufacturer's latest standard or current model.

C. All equipment and method shall be installed and connected in accordance with the best engineering practices and in accordance with the manufacturer's recommendations.

D. Mechanical work includes, but is not limited to:

1. Make arrangements with local utility company for services as shown or specified.
2. Obtain all permits and inspections including: building permits, health department permits and sewer tap permits.
3. Disconnect, remove and re-install mechanical services located on or crossing through contract limits, above or below grade, obstructing construction of project or conflicting with completed project or any applicable codes.
4. Modify, extend or tie-into existing mechanical services or systems.
5. Complete insulation on piping and equipment.
6. Complete the chilled water system.
7. Complete alterations and additions to the refrigerant piping system.
8. Complete alterations and additions to the condensing units.
9. Complete alterations and additions to the air handling systems.

10. Install devices furnished by the Temperature Controls sub- contractor.

## 1.3 WORK NOT INCLUDED:

A. Finish painting of piping, ductwork or equipment.

B. Electrical wiring and conduits shown on the electrical drawings.

C. Asbestos removal.

## 1.4 RELATED WORK SPECIFIED ELSEWHERE:

A. Electrical: Division 16.

## 1.5 REQUIREMENTS OF REGULATORY AGENCIES:

A. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.

B. Install the work under this Division in accordance with drawings and specifications and the standards and codes (latest edition) that apply to this work. In the event of a conflict, install work in accordance with the most stringent code requirements.

C. Arrange, pay for and complete work to pass required tests by agencies having authority over work. Deliver Certificates of Inspection and approval issued by authorities.

## 1.6 GENERAL JOB REQUIREMENTS:

A. QUALIFICATION OF CONTRACTOR:

1. Has completed minimum two projects same size and scope in past five (5) years.

2. This qualification applies to Sub-Contractors.

3. Use workmen experienced in their respective trade. Submit qualifications of Superintendent for review.

B. The STATE reserves right to reject bid of any bidder failing to meet these qualifications.

C. Drawings and Specifications:

1. Work for the mechanical trades are shown on the drawings series M (HVAC).
2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.

3. Drawings are drawn to a small scale and are diagrammatic only. The drawings indicate size and general arrangement of equipment.
4. Do not scale drawings for exact locations. Refer to dimensional plans. Field measurements take precedence.

D. Provide all necessary offsets, elbows and fittings in piping as required to avoid conflict with work of other trades. Maintain proper headroom and clear passageways to allow adequate access and working clearances for equipment dampers, valves, etc. This shall be done at no additional cost to the Owner.

E. Visit to Site/Work in other Division:

1. Examine not only the plans and specifications for this Division, but plans and specifications of the other Divisions of work and visit the site to become acquainted with existing conditions. Execution of Contract is evidence that Contractor has examined all drawings and specifications, and that all conditions which have a bearing in any way on the manner of installing the work in this Division are known. Later claims for labor and materials required due to difficulties encountered will not be recognized.

**F. DEFINITIONS**

1. Concealed: Materials or systems not visible. Work installed above a ceiling, furred behind a wall or enclosed in a chase.

2. Exposed: Materials or systems that is visible. Work installed in a room without a ceiling. Work not enclosed by walls.

3. Provide: Furnish, install and make complete.

4. Install: Receive, unload, move into place, and make connections.

5. Work: Materials completely installed and connected.

6. ADC: Air Diffusion Council.

7. AGA: American Gas Association.

8. AMCA: Air Movement and Control Association.

9. ANSI: American National Standard Institute.

10. API: American Petroleum Institute.

11. ARI: American Refrigeration Institute.

12. ASHRAE: American Society of Heating, Refrigerating and Air

Conditioning Engineers.

13. ASME: American Society of Mechanical Engineers.

14. ASTM: American Society of Testing Materials.

15. AWS: American Welding Society.

16. FM: Association of Factory Mutual Fire Insurance Company.

17. International: Building Code, Gas Code, Mechanical Code, Plumbing Code.

18. MSS: Manufacturer's Standard Society of the Valve and Fittings Industry, Inc.

19. NEC: National Electrical Code.

20. NEMA: National Electrical Manufacturer's Association.

21. NFPA: National Fire Protection Association.

22. NRCA: National Roofing Contractors Association.

23. NSF: National Sanitation Foundation.

24. OSHA: Occupational Safety and Health Act.

25. PDI: Plumbing Drainage Institute.

26. PFMA: Power Fan Manufactures Association.

27. SMACNA: Sheet Metal and Air Conditioning Contractors National Association.

28. Standard: Building Code, Gas Code, Mechanical Code, Plumbing Code.

29. UL: Underwriters Laboratories.

**G. WORKMANSHIP, WARRANTY AND ACCEPTANCE:**

1. Work under this Division shall be first class with emphasis on neatness and workmanship.
2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation subject to Engineer's observation, final approval, and acceptance. Engineer may reject unsuitable work.

3. Furnish owner written warranty, stating that if workmanship and/or materials executed under this Division are proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.
4. In event that project is occupied or system placed in operation in several phases at Owner's request, warranty will begin on date each system or item of equipment is accepted by Owner.

## H. OBSERVATIONS OF WORK AND DEMONSTRATION OF OPERATION:

1. When observations are scheduled, provide sufficient personnel to expedite removal of access doors, coverplates, manholes covers, etc.
2. Contractor to demonstrate operation of new systems to satisfaction of Owner. Contractor to have manpower available for demonstration of systems where requested by Owner.

## I. MATERIALS AND SUBSTITUTIONS:

1. All materials shall be new. All materials and equipment, for which a UL Standard, an AGA approval, an AWWA standard, FM listing or ASME requirements is established, shall be so approved and labeled or stamped.
2. Wherever in these specifications products are specified by manufacturer's name, bids shall be based on the named products. Where more than one manufacturer's name is mentioned, the one first listed establishes the standard for that product. If the bidder desires to submit a product of a manufacturer other that listed first, it must be the equivalent of the one listed first.
3. The drawings are based on the use of products specified and listed first. If any revision in piping, ductwork, conduit work, foundations, anchor bolts, connections, etc., is required by other named products or approved substitutions, it shall be the Contractor's responsibility to make such revisions at no additional expense to the Owner.
4. If any bidder desires to submit products of manufacturers not listed, he may submit a request for prior approval to the Engineer no later than 10 days prior to the bid date. If the Engineer decides to accept the manufacturers, they will be listed as "Approved" by written addendum.
5. If the manufacturers are not listed as approved either by addendum or in the specifications, they will not be accepted.
6. Submit to Engineer within14 days after award of contract a complete list of proposed material manufacturers. List does not preclude submission of shop drawings. Approval of manufacturer or list does not constitute approval of specific material or equipment.

## J. SHOP AND ERECTION DRAWINGS:

1. Submit complete shop drawings for all materials and equipment furnished under Division 15 of specifications, to Architect for review within 30 days after award of contract. Shop drawings shall be submitted on a timely

basis to allow adequate lead time for review, resubmission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Architect/Contractor. On each shop drawing include the specification section that applies to that submittal. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Architect. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by him. Drawing submitted without this stamp of approval will not be considered and will be returned for proper resubmission.

2. Drawings larger than 8-1/2" x 11", submit three (3) copies and one (1) reproducible of each drawing. Architect will retain two (2) copies and return one (1) reproduction and one (1) copy to Contractor. Contractor is responsible for copying reproducible for distribution.
3. 8-1/2" x 11" drawings in brochure: Submit six (6) original copies for review. Architect (and) Engineer] will retain two (2) copies and return four (4) copies to Contractor. Division 1 "General Conditions" take precedence over this specification.
4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor's responsible for meeting the requirements of the contract documents.
5. Contractor is responsible for dimensions and sizes of equipment. Inform Engineer in writing of equipment differing from that shown.

## K. OPERATING AND MAINTENANCE MANUALS:

1. Provide maintenance and operating manuals bound in 8-1/2" x 11" hardback, three-post binders. Manuals shall contain written instructions for each system, shop drawings, schematic drawings, equipment catalog cuts, manufacturer's instructions, manufacturer's warranties, and valve tag list.
2. Arrange information in the following sequence: title of job, Owner, address, date of submittal, name of Contractor, name of Engineer, index, shop drawings, operating instruction, Contractor's purchase order numbers, supplier's name and address, date of start-up of each piece of equipment and valve tag list.
3. Submit one (1) copy for review. Make required corrections, and submit two (2) record copies.

## L. "RECORD" BLUE LINE PRINTS:

1. Provide "Record" blue line prints at the completion of job. One complete set of blue line prints will be furnished to the Contractor for record drawings. Keep set of prints on job and record day to day changes to Contract drawings with red pencil. Indicate actual location of piping and equipment. Turn over prints to Engineer at final observation.
2. Provide the following items for Owner at time of substantial completion:
   a. Certificates of inspection and approval from authorities having

jurisdiction.
b. Warranties.
c. "Record" blue line prints.
d. Operating and Maintenance Manuals (3 copies).
e. Spare Parts (furnish receipt).
f. Affidavit of Owner Instruction (1 copy).
g. Release of Liens.

## 1.7 PROTECTION AND STORAGE:

A. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.

B. Protect all equipment and materials, from damage by weather, entrance of water or dirt. Cap open piping, use plastic covers made for that purpose. Do not use rags or construction debris.

C. Avoid damage to materials and equipment in place. Repair, or remove and replace damaged work and materials.

D. Protect all surfaces from weld spatter, solder and cutting oil.

E. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner.

B. 2) Document 15010 has verbiage about what is not covered. It state painting etc yet in one of the proceeding documents it states the Contractor will fix any damage with paint, etc. it was a little confusing to me.

C. We do have standard language for clean-up as well. The following is a section pulled from another bid –

## 1.8 SALVAGE

A. All equipment or material to be removed must be removed by the awarded vendor and must be stored, where directed and, at the STATE's option, must remain the property of the STATE; however, if the STATE elects not to retain ownership, then it must become the property of the vendor who must remove it from the premises.

## 1.9 REMOVAL OF REFUSE

A. All refuse, debris, packing boxes, removed equipment, etc., must be promptly removed from the property by the awarded vendor as it accumulates.

B. The awarded vendor must not use the STATE’s containers or dumpsters for debris, packaging, or any material disposed of. All vendor disposed material

must be removed from site by the vendor and disposed of.

C. Where possible, divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable materials by developing and implementing a waste management plan that clearly segregates the recyclable materials and proper disposal containers from the general debris. Redirection of recyclable materials may include donation of materials to charitable organizations and salvaging of material(s) on-site.

## 1.10 CLEANUP

A. The awarded vendor will work with the STATE to dispose of any copper removed in accordance with State of Alabama policies.

B. The awarded vendor, and its Subcontractors, employees, and agents, shall keep STATE Facilities in good order, shall not commit or permit waste or damage to such facilities, and shall not use such facilities for any unlawful purpose or act. The awarded vendor and its Subcontractors employees shall comply with all applicable laws and regulations, including all of the STATE's standard policies, standards, and procedures that are provided to the CONTRACTOR (upon request) regarding access to and use of the STATE's facilities, including the physical security of the STATE's facilities.

END OF SECTION 15010

**SECTION 15030 - COORDINATION**

PART 1 - GENERAL

## 1.11 DRAWINGS FOR MECHANICAL AND ELECTRICAL WORK

A. Drawings contain diagrammatic layouts and indicate general arrangement of systems, piping conduit, etc.

B. Prior to installation of material and equipment, review and coordinate work with Architectural and Structural Drawings and other Division work for exact space conditions; where not readily discernable request information from Architect before proceeding.

C. Check Drawings of all other trades to verify extent of material and equipment to be installed in spaces available and consider layout alternatives so that all requirements can be accommodated.

D. Maintain maximum headroom at all locations without finished ceilings.

E. Maintain finished ceiling heights as indicated on Architectural reflected ceiling plans, and building sections and elevation drawings.

F. Coordinate installations with other trades prior to proceeding to prevent conflict with work of other trades and cooperate in making reasonable modifications in layout as needed.

G. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Architect shall be consulted for assistance in coordination of the available space to accommodate all trades.

H. Coordinate equipment installation to maintain manufacturer and code required working clearances

## 1.12 PRIORITY OF CONSTRUCTION SPACE

A. Following is the Order of Priority for Construction Space:

1. First: Ductwork.
2. Second: Fire protection piping.
3. Third: Other piping.
4. Fourth: Conduit.

## 1.13 COORDINATION DRAWINGS

A. The awarded vendor shall prepare a complete set of "Cronoflex Mylar" type background drawings at scale of minimum 1/4" equals 1'-0".

1. The construction documents in their original, copies or electronic file form are the Architect's instrument of service and are protected under copyright laws. The reproduction of these documents for use as coordination drawings or shop drawings is prohibited without the Architect's written consent and authorization.

B. Each specialty trade listed below shall prepare a coordination Mylar overlay indicating his work, with appropriate elevations and grid dimensions.

C. Each specialty trade shall sign and date the coordination Drawing after the addition of his information.

D. Fabrication shall not start until receipt of completed coordination drawings is acknowledged by the Contractor in writing to the Architect.

E. Specialty Trades:

1. Other piping
2. Electrical

F. Coordination Drawings required for all mechanical rooms, electrical rooms, equipment rooms, corridors, horizontal exits from duct shafts, cross overs and any other areas where congestion of work may occur.

**G. COORDINATION SCHEDULE DRAWING:**

1. The mechanical and plumbing contractor shall furnish to electrical contractor for coordination a schedule drawing providing all the electrical characteristics of all mechanical and plumbing equipment requiring electrical connection. The information provided shall include:
   a. Unit Designation
   b. Voltage
   c. MCA
   d. MOCP/MFS
   e. FLA
   f. Disconnect Requirement
   g. Starter Requirement
   h. Alarm Wiring Requirements

2. The coordination schedule drawing, once received by the electrical contractor, shall be reviewed and all pertinent electrical accommodations indicated.
   a. Breaker size.
   b. Wire size / conduit size.
   c. Disconnect with fuse size.

3. Once the coordination schedule is completed forward to the engineers for review and approval.

H. Any deviation in the mechanical equipments which results in a change in the electrical scope of work shall be the responsibility of the mechanical contractor. The mechanical contractor shall reimburse the electrical contractor for any cost. No added cost to the owner will be allowed.

I. Conflicts that arise due to the fact that the coordination schedule drawing was not completed shall be the sole responsibility of the contractors. All costs for correction or remedial work shall be done at the contractor's expense. No added cost to the owner will be allowed.

END OF SECTION 15030

## SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## 1.2 CODES AND STANDARDS:

A. Clean Air Act 1990

B. Refrigeration Service Engineers Society

## 1.3 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.
13. Fire stopping
14. Piping Seals
15. Pipe Supports
16. Pipe Identification

## 1.4 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

## 1.5 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.
5. Fire stopping
6. Piping Seals
7. Pipe Supports
8. Pipe Identification

B. Welding certificates.

## 1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## 1.8 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inchmaximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

## 2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Dresser Industries, Inc.; DMD Div.
   c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
   d. JCM Industries.
   e. Smith-Blair, Inc.
   f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. **PLASTIC-TO-METAL TRANSITION FITTINGS:** **CPVC and PVC** one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Elson Thermoplastics.

C. **PLASTIC-TO-METAL TRANSITION ADAPTORS:** One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Thompson Plastics, Inc.

D. **PLASTIC-TO-METAL TRANSITION UNIONS:** MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:
   a. NIBCO INC.
   b. NIBCO, Inc.; Chemtrol Div.

E. **FLEXIBLE TRANSITION COUPLINGS FOR UNDERGROUND NON-PRESSURE DRAINAGE PIPING:** ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Fernco, Inc.
   c. Mission Rubber Company.
   d. Plastic Oddities, Inc.

## 2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:
    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Eclipse, Inc.
    d. Epco Sales, Inc.
    e. Hart Industries, International, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- minimum working pressure as required to suit system pressures.

1. Manufacturers:
    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Epco Sales, Inc.
    d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:
    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
    a. Calpico, Inc.
    b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:
    a. Perfection Corp.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Victaulic Co. of America.

## 2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: **EPDM** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: **Stainless steel**. Include two for each sealing element.
4. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Under deck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: **Polished chrome-plated**

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: **Polished chrome-plated**

E. One-Piece, Floor-Plate Type: Cast-iron floor plate.

F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.9 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

## 2.10 FIRESTOPPING AND SOUNDSTOPPING:

A. Fire stopping materials shall conform to ASTM E 814 and E 119.

B. Penetration Sealants:

1. Flame Stop Distribution, Inc., Flame Stop V.
2. 3M Brand "Fire Barrier" CP 25 WB Caulk.
3. 3M Brand Moldable Putty "Pads" and Moldable Putty MPS-2 "Stix."

C. Intumescent Sealants for use in openings and sleeves involving plastic pipe, insulated pipe or flexible cable:

1. Flame Stop Distribution, Inc. Flame Stop VP with Retaining Fixture.
2. 3M Brand "Fire Barrier" Caulk, with FS-195 Wrap Strip and CS-195 Composite Sheet.

D. Sound stopping material shall be .75 lb per cu. ft. density fiberglass.

E. Other acceptable manufacturers include GE "Pensil", Dow Corning, Hilti.

PART 3 - EXECUTION

## 3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

## 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type with spring clips.
   d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
   e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
   f. Bare Piping at Ceiling Penetrations in Finished Spaces: [**One-piece or split-casting**], cast-brass type with polished chrome-plated finish.
   g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with [**rough-brass**] finish.
   h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
   i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

**2. <u>EXISTING PIPING: USE THE FOLLOWING:</u>**
   a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
   b. Insulated Piping: Split-plate, stamped-steel type with [**concealed**] hinge and spring clips.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
   d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
   e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with [**rough-brass**] finish.
   f. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with [**concealed**] hinge and set screw or spring clips.
   g. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.

h. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. [**Steel**] Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

      ♦ Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space

between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Refer to Division 7 Section "Through-Penetration Fire stop Systems" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

## 3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Non-pressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasket Joints: Join according to ASTM D 3139.

K. Plastic Non-pressure Piping Gasket Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

## 3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

## 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

## 3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

## 3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section.

B. Concrete Housekeeping Pads:

1. Provide concrete housekeeping pads under all floor mounted equipment, pipe support and duct supports and where indicated.
2. Housekeeping pads shall be not less than 3 ½ thick, sized at least 8 in. larger than the equipment.
3. Pads shall be doweled to floor with not less than 4 No. 4 bars grouted in place.
4. Pads shall have chamfered edges.
5. Pads shall receive a broom finish.
   NOTE: Anchor bolts for equipment shall be poured integral with the pad.
6. Pads shall be reinforced with at least one No. 4 bar (stirrups).

## 3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

## 3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

## 3.10 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

## 3.11 FIRE STOPPING AND SOUND STOPPING:

A. Provide penetrations for piping through floors and walls for work under this contract.

B. Penetrations through floors and fire resistant walls shall be sealed to the rated fire resistance equal to the wall. Installation shall be done by a qualified installer, approved by the manufacturer.

C. Provide sound proofing through non-rated walls.

D. In an existing building all penetrations through floors and fire resistant walls shall be sealed at the end of each working day. These closures shall have an equal fire resistance rating to the floor or wall.]

## 3.12 EXCAVATION, SHORING AND BACKFILL:

A. Provide any excavation required for work in this Division. Refer to soil borings for type of sub-grade materials.

B. Provide separate trench for each utility.

C. Provide bracing, shoring, sheet piling to protect sides of excavation, workers and adjacent structures. Provide site de-watering systems where water level is above bottom of trench.

D. Provide barricades and lights to protect open excavations. Provide pedestrian bridges for foot traffic across excavation.

E. Provide steel plates over excavations for automobile and truck traffic across excavations.

F. Remove all timber and foreign material from excavation before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill materials shall be approved clay or chert, free of debris, rock larger than 1-1/2 inch or other harmful material.

G. Backfilling shall be done in 12 in. lifts or layers. All backfilling shall be compacted to the Modified Proctor Density (ASTM D-1557) listed below:

| 90 Percent | 95 Percent |
|---|---|

Under sidewalks paved areas
Grassed areas under structures
Building slabs

H. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged by work in this Division.

**3.13 ANCHORS:**

A. Mount all equipment, brackets, hangers, anchors, etc. to safely resist the vibration or thrust forces and support the unit's weight.

B. Floor mounted rotating or vibrating equipment shall be anchored to the floor using grouted-in-place or cast-in-place anchor bolts with three inch hook and sleeve. Anchor bolts shall be of the size recommended by the manufacturer.

C. Floor mounted static items, wall and ceiling mounted equipment bracket and hangers shall be installed using drilled anchors Or cast in place inserts]. Anchors shall be Phillips Drill Company "Red Head" or Multi-Set II. Refer to Division_____ for inserts]. Size anchors And inserts] for four times the applied load. Bolts used outdoors or in a wet environment shall be hot dip galvanized.

**3.14 PIPE IDENTIFICATION:**

A. Provide pipe markers and directional arrows on pipes at both sides of partitions and floors slabs, at branch line take-offs, at valves, at intermediate intervals not in excess of 20 ft. and at connections to equipment.

B. Tape color band identifying markers and arrows on each pipe, both insulated and bare pipes. Pipe markers and arrows shall be located where readily visible and on lower quadrants of overhead pipes.

C. Submit schedule of pipe markers, with legend and background colors for approval by the Architect.

**3.15 EQUIPMENT IDENTIFICATION:**

A. Stencil on the equipment the functional name and equipment number of each piece of equipment as it is scheduled, i.e. pumps, tanks, fans, chillers, air handling units, water softeners, etc.

B. Stencil letters shall be black 1 in. high, located on a white background.

C. Identify each piece of equipment with a 1/8 inch thick engraved melamine plastic laminate nameplate. Letters shall be 1/2 inch high standard style. Names, abbreviations, and numbering shall agree with the corresponding equipment designations shown on the drawings. Use black letters cut in a white background for all equipment on standard electrical power and use white letters cut in a red

background for all equipment on emergency power. (Coordinate with Division 16 "Electrical" Contractors).

D. Fasten nameplates to equipment in a conspicuous location using self-tapping stainless steel screws, except use contact epoxy adhesive where screws cannot or should not penetrate substrate.

## 3.16 REFRIGERANT RECOVERY:

A. All work on refrigerant systems shall employ service techniques that prevent release of refrigerants to the atmosphere.

B. Remove all refrigerant. Place refrigerant in DOT approved containers for recycling/re-use.

## 3.17 WORKMANSHIP:

A. Pipe size changes shall be made at reducing fittings. Bushings shall not be used.

B. Provide drain valves at points where water is trapped in piping.

C. Install pipe to prevent noise or water hammer.

D. Blowout or flush out all lines prior to final connection or start-up, to remove foreign matter.

E. Make allowance in piping for expansion and contraction, for installation of insulation and to avoid air pockets.

F. Do not tap small pipes into larger pipes. Provide fittings or reinforced branch connections.

G. Cut pipes ends square, ream and de-burr. Cut threads clean and sharp. Pipe threads shall conform to ANSI B 2.1.

H. Pull up threaded fittings to a tight fit with an approved good quality pipe joint compound applied to male threads.

I. Inspect screwed joints for leakage and remake each joint that appears to be faulty. Do not wait for rust to form. Clean threads on both parts apply compound and remake joints.

J. Clean piping strainers after start-up by removing strainer screen and wire brushing.

K. Conceal pipes in pipe shafts, partitions and furred spaces except where otherwise distinctly indicated on the drawings. Each riser shall be separately valved.

L. Every branch pipe shall be controlled by a valve where it connects to the supply main or riser.

M. Valves shall be easily accessible, with proper clearance for maintenance. Valves inside furred spaces, behind access doors shall be grouped to keep the number of access doors and their sizes to a minimum.

N. Provide drain valves at the base of each riser.

O. Provide drain valves and drain lines from pumps, heaters, water cooled equipment, relief valves, etc., and pipe to floor drains.

P. Tighten flanges and packing glands after the system has been placed in operation. Replace gaskets in flanges that show any signs of leakage after tightening.

Q. Install NO piping in electrical switchgear room, transformer vaults, telephone rooms or electrical closets. Provide drip pans under drain piping above electrical switchgear in mechanical rooms.

R. Install piping in alignment with and parallel to the walls of the building. All risers shall be plumb.

S. No cross connections shall be installed between potable water systems and polluted supply or waste systems.

T. Provide valves and unions or flanges at equipment such as pumps, coils, tanks, automatic valves, heat exchangers, etc. Provide valves on capped branches for extension by other contractors.

U. Support piping at the proper intervals. Adjust pipe hangers and supports for correct pitch and alignment. Brace piping systems which sway.

V. Remove rust, scale, and foreign materials from equipment and renew any defaced surfaces. If equipment is marred, provide new materials.

W. Protect insulation. Repair insulation that is damaged. Keep it dry and free of tears. Allow no punctures in vapor barrier. Insure good tape adhesion. Provide smooth surfaces in finished areas.

X. Pitch sanitary and storm lines: pipes 3 in. and larger not less than 1/8 inch per foot, pipes 2 inch and smaller not less than 1/4 inch per foot. Make changes in grade or direction by "Y" branches.

Y. Pitch vent piping to free themselves of water and condensation. Install vent branches not less than 42 inches above floor. Clean fixtures of labels and stains with whiting and alcohol. Clean copper tubing and fittings with steel wool to remove traces of oxidation.

Z. All copper tubing shall be hard drawn unless noted otherwise. Annealed tubing where used shall be stretched, and installed with tool formed bends.

**3.18 HOT TAPS:**

A. Make all piping connections to existing active systems utilizing a hot tap kit to avoid shut-down of existing service.

B. Hot tap kit shall utilize thread-o-let and full port gate or ball valve to allow connection to be made without disrupting service to the facility. Kit shall be designed to remove drilled plug from existing pipe.

END OF SECTION 15050

**SECTION 15510 - HYDRONIC PIPING**

PART 1 - GENERAL

**1.14 DESCRIPTION OF WORK:**

A. The work required under this section includes all work necessary for a complete installation of chilled water piping, hot water piping, and condenser water piping.

B. The work of this section is subject to the requirements of the Mechanical General Section 15010.

**1.15 RELATED WORK SPECIFIED ELSEWHERE:**

| | | |
|---|---|---|
| A. | Basic Materials and Methods | - Section 15050 |
| B. | Insulation | - Section 15260 |

**1.16 CODES AND STANDARDS:**

A. ASME/ANSI B31.9 Building Services Piping

B. AWS/ANSI D10.9 Qualification of Welding Procedures and Welders for Piping and Tubing

C. ASME/ANSI Boiler Pressure Vessel Code Section IX

**1.17 SUBMITTALS:**

A. Submittals shall include manufacturer's data sheets showing pressure and temperature rating.

B. Furnish welders certification.

PART 2 - **PRODUCTS**

D. Pipe:

1. Carbon steel sizes up to and including 2 inches. Schedule 40, ASTM A106, Seamless.
2. Carbon steel sizes 2-1/2 inches up to and including 10 inches. Schedule 40, ASTM A53 Grd B, Seamless, or ERW.
3. Carbon steel sizes 12 inches and larger, .375 in thick wall, ASTM A53 Grd B, Seamless, or ERW.
4. Copper Tubing, type L hard drawn conforming to ASTM B-88 may be used on sizes up to and including 2 inches.

E. Fittings:

1. 2 inches and smaller: Screwed fittings shall be malleable Iron ASTM A-197 class 150 conforming to ANSI B16.3. Dimensions conforming to Federal Spec WW-P-521. Fittings shall be Grinnell, Flagg or Stockham.
2. 2-1/2 inches and larger: Welding fittings shall be carbon steel butt-welding type conforming to ASTM A234. Elbows shall be long radius type. Welding tees shall be used on branch connections equal to or greater than ½ the diameter of the main run. Use 150 lb. fittings on Schedule 40 pipe. Fittings shall be Ladish, Tube-Tube, or Weldbend.
3. Carbon steel reinforced branch, welding fittings up to 3 inches, but not greater than ½ the diameter of the main run may be used. Fittings shall be Bonney Forge or Phoenix Forging.
4. 2 inches and smaller: Copper fittings may be wrought copper solder type conforming to ASTM B-75, equal thickness to the tubing run. Fittings shall be Nibco, Mueller or Revere.

F. Flanges:

1. Carbon steel flanges shall conform to ANSI B16.5, ASTM A105. Flanges shall be Class 150, slip-on or weld-neck, 1/16 inch raised face. Flanges shall have the same bore as pipe. Flanges shall be Ladish, Tube-Turn or Weldbend.
   **Note**: Flanges which must mate with cast or ductile iron flat face flanges shall have the raised face machined off. Use full face gaskets.
2. Flanges on copper tubing shall be cast brass, conforming to ANSI B16.8.
3. Dielectric flange fittings shall be suitable for 175 psi, conforming to ANSI B16.42 or B16.24. Dielectric flange shall be Watts Series 3000 or EPCO.

G. Unions:

1. Screwed unions shall be malleable iron ASTM A-197, class 250 with ground joint brass to iron seat. Unions shall be Dart or Grinnell.

2. Solder unions shall be wrought copper. Unions shall be Nibco, Mueller or Revere.
3. Dielectric unions shall be Class 250, conforming to ANSI B16.39. Unions shall be Watts, Series 3000 or EPCO.

H. Valves: To be manufactured to the following Specifications:

1. Bronze:
   a. Gate, Globe, Angle & Check - MSS-SP-80
   b. Ball - MSS-SP-110

2. Iron:
   a. Gate - MSS-SP-80
   b. Globe - MSS-SP-85
   c. Check - MSS-SP-71

3. Cast Steel:
   a. API-600, ASTM B-16.34 & B-16.10.

4. Gate Valves (All Fluids):
   a. Sizes up to and including 2 inches shall be ASTM B-61 bronze, threaded, inside screw, rising stem, with union bonnet, Stem material to be ASTM B-61 bronze, malleable iron hand wheel, suitable for 200 psi W.S.P. Valve shall be Hammond IB 650 or equal. Domestic Hammond, Nibco, Powell.
   b. Sizes 2-1/2 inches through 12 inches shall be IBBM, flanged, OS & Y with bolted bonnet suitable for 125 psi WSP. Valve shall be Hammond IR1140 approved equal.
   c. Domestic: Hammond, Nibco, Powell, Import Hammond IR1140HI, Crane, Stockholm, and Walworth.

D. Ball Valves:

1. Sizes through 2 inch shall be two piece, bronze bodies, Solid chrome plated ball, Adjustable packing gland (threaded to body) RTFE seat, full flow, suitable for 600 psi WOG. Hammond 8500 series or equal.
2. Sizes 2 1/2 in. through 4 in. shall be class 150 flanged carbon steel body, stainless steel ball, reinforced TFE seats, full port, suitable for 285 psi WOG. Hammond 9943 or equal.
3. All ball valves shall have stem extensions for the thickness of insulation specified where required.
4. Ball valves shall be Hammond, Apollo, or Nibco.

E. Butterfly Valves:

1. Butterfly valves larger than 3 in. shall be lug type, 200-psi cwp, Hammond 6211 series, or equal Nibco, Grinnell or Powell. Valves shall have cast iron body, aluminum bronze disc, extended neck, and stainless steel shaft and field replaceable EPDM liner. Valves used for balancing infinite

position lever with memory stop. Manually operated valves 6 in. and larger shall be gear operated with hand wheel. Valves 5 in. and smaller shall be 10 position lock lever operated type.

F. Hose-End Gate Valves:

1. Drain valves shall be all bronze, non-rising stem for 300 psi WOG, with hose end adapter, cap and chain. Valve shall be 3/4 in. NPS unless indicated otherwise.

G. Relief Valves:

1. Relief valves are listed separately by piping system in specific articles or scheduled on the drawing.

H. Globe Valves:

1. Sizes up to and including 2 in. shall be ASTM B-62 bronze body, threaded, inside screw rising stem, with union bonnet, Stem to be ASTM B-62, malleable iron hand wheel, suitable for 150 psi WSP. Valves shall be Hammond IB413T or approved equal. Domestic Hammond, Nibco, Powell.
2. Sizes 2 1/2 in. through 12 in. shall be iron body, bronze mounted, OS&Y with bolted bonnet, suitable for 125 psi WSP. Valve shall be Hammond IR116 or equal; Domestic Hammond, Nibco, Powell Import, Hammond IR116HI or equal Crane, Walworth.

I. Check Valve - Double Plate, Center Hinged:

1. Sizes 4 in. through 12 in. shall be iron body bronze mounted, flat face, non-slam type with Buna-N seal, stainless steel pin and springs. Valves shall be suitable for 175 psi WOG. Valves shall be Hammond IR9354, Mission Valve & Pump Co., Mueller Steam Specialty or approved equal.

J. Check Valve (Swing Check):

1. Sizes up to and including 2 inch shall be ASTM B-61 bronze pattern, threaded Y pattern swing check, screwed bonnet, trim material to be ASTM B-61 bronze, regrind able seats suitable for 200 psi WSP. Valve shall be Hammond IB944 or approved equal. Domestic Hammond, Nibco, Powell Import, Hammond IR116HI or equal Crane, Stockham, Walworth.
2. Sizes 2-1/2 in. through 12 in. shall be iron body bronze mounted, flanged with bolted cap, renewable seats and disc, suitable for 125 psi WSP. Valves shall be Hammond IR1124 or approved equal. Domestic Hammond, Nibco, Powell Import, Hammond IR1124HI or approved equal Crane

K. Gaskets:

1. Garlock, Blue Gard series 3000 non-asbestos, ring type. Gaskets for flanges 4 inches and smaller shall be 1/16 inch thick, for larger flanges 1/8 inch thick.

L. Bolts:

1. Bolts shall be carbon steel, conforming to ASTM A-307, grade B without heat treatment other than stress relief.
2. Nuts shall be carbon steel conforming to ASTM A-563 Grd A, A-194 Grd 1.

**Note**: On sizes 2 inches and smaller where copper piping is used, ball valves, gate valves, globe valves, and check valves may be equal to the above specified valves but with solder joint connections.

M. Solder:

1. Solder Metal shall conform to ASTM B32-60aT water piping: 95 percent tin, 5 percent antimony. Solder with lead shall not be used for water piping.

PART 3 - EXECUTION

F. All steel piping three inches and larger shall have flanged joints with welded fittings. Contractor may weld lines smaller than 3 inches.

G. Pipe for welding shall have butt-welded joints. For all weld joints, properly bevel pipe ends.

H. Welding shall be done by electric arc process, only by certified welders.

I. Provide unions or flanges in piping connections to each valve, coil or piece of equipment and elsewhere as required to make-up or disconnect piping. Provide unions or flanges to permit removal of valves, coils, equipment, etc., without disconnecting any piping except unions or flanges.

J. Provide dielectric unions, or insulating flanges between ferrous and non-ferrous piping.

K. Slope piping upward toward nearest venting point at not less than 1/4 inch per 10 feet.

L. Provide valves at the branch take-off of all risers.

M. Install control valves, thermo wells, flow sensors, etc. furnished by Temperature Controls Sub-Contractor.

N. Provide valved taps for pressure switches, flow meters, required by Temperature Control Sub-Contractor.

O. Provide 3/4 inch drain valves at all low points. Drain valves shall be ball valves with hose-end connections. Provide cap and chain for hose-end connection.

P. Discharge of relief valves shall be piped to floor drain or outdoors unless shown otherwise.

Q. All soldered piping and equipment connections shall be properly prepared in accordance with good piping practice and manufacturer's instructions.

R. Provide air vents at all high points and where shown. Air vents shall be 3/4 inch globe valves with hose end connections.

N. Install piping to allow flexibility for expansion.

O. Test all piping prior to insulating, concealment and connection to equipment or specialties.

P. Provide all pumps, gauges, connections, etc., required to perform tests.

Q. Test all piping hydrostatically at 1-1/2 times the working pressure, but not less than 125 psig for four hours without loss of pressure.

R. Protect equipment or materials from overpressure while testing of piping.

S. Install valves with stems upright or horizontal.

T. After testing, drain all lines.

U. At Contractor's option, condenser water piping 2 1/2 in. and larger may be installed using mechanical locking or bolted device type couplings, with a pressure-responsive gasket along with mechanical pipe fittings, as manufactured by the Victaulic Company of America or prior approved equal. Victaulic zero-flex rigid couplings, S/07, shall be installed on all horizontal pipe lines. All grooved couplings and fittings shall be of the same manufacturer.

END OF SECTION 15510

**SECTION 15855 - SPLIT-SYSTEM AIR-CONDITIONERS**

**1.18 GENERAL**

**a. RELATED DOCUMENTS**

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

b. SUMMARY

(1) This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

c. SUBMITTALS

(1) Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

(2) Shop Drawings: Diagram power, signal, and control wiring.

(3) Samples for Initial Selection: For units with factory-applied color finishes.

(4) Field quality-control test reports.

(5) Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

(6) Warranty: Special warranty specified in this Section.

**d. QUALITY ASSURANCE**

(1) Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

(2) Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

(3) ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

(4) ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

**e. COORDINATION**

(1) Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

**f. WARRANTY**

(1) Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

(a) Warranty Period: **Five** (5) years from date of Substantial Completion.

**g. EXTRA MATERIALS**

(1) Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

(a) Filters: One set of filters for each unit.
(b) Fan Belts: One set of belts for each unit.

**1.19 PRODUCTS**

a. MANUFACTURERS

(1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

(2) Manufacturers: Subject to compliance with requirements, provide products by one of the following:

(a) Sanyo Fisher (U.S.A.) Corp. or comparable.

(b) AC units recommended are Enviromaster WCP24/30, Sanyo 24KLS72 or comparable units.

**b. WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS**

(1) Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

(a) Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
(b) Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

(2) Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

(3) **Water** Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; and having a 2-position control valve.

(4) Fan: Direct drive, centrifugal fan.

(5) Fan Motors: Comply with requirements in Division 15 Section "Common Motor Requirements for HVAC Equipment."

(a) Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.

(6) Filters: **Permanent, cleanable**.

**c. AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS**

(1) Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

(2) Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

(a) Compressor Type: [**Reciprocating**] [**Scroll**].
(b) Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
(c) Refrigerant: R-410A.

(3) Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

(4) Fan: Aluminum-propeller type, directly connected to motor.

(5) Motor: Permanently lubricated, with integral thermal-overload protection.

(6) Low Ambient Kit: Permits operation down to 45 deg F.

(7) Mounting Base: Polyethylene.

(8) Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

d. ACCESSORIES

(1) Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

(a) Compressor time delay.
(b) 24-hour time control of system stop and start.
(c) Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
(d) Fan-speed selection, including auto setting.

(2) Automatic-reset timer to prevent rapid cycling of compressor.

(3) Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

(a) Minimum Insulation Thickness: **3/4 inch** thick.

## 1.20 EXECUTION

a. INSTALLATION

(1) Install units level and plumb.

(2) Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

(3) Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

(4) Install ground-mounting, compressor-condenser components on polyethylene mounting base.

(5) Install roof-mounting compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

(6) Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

b. CONNECTIONS

(1) Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

(a) Water Coil Connections: Comply with requirements in Division 15 Section "Hydronic Piping." Connect to supply and return coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
(b) Remote Water-Cooled Condenser Connections: Comply with requirements in Division 15 Section "Hydronic Piping." Connect to supply and return with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
(c) Steam Coil Connections: Comply with requirements in Division 15 Section "Steam and Condensate Heating Piping." Connect to steam piping with shutoff valve and union or flange; for condensate piping, starting from the coil connection, connect with union or flange, strainer, trap, and shutoff valve.

(2) Install piping adjacent to unit to allow service and maintenance.

(3) Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply **and return** ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Air Duct Accessories."

(4) Ground equipment according to Division 16 Section "Grounding and Bonding for Electrical Systems."

(5) Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

c. FIELD QUALITY CONTROL

(1) Perform the following field tests and inspections and prepare test reports:

(a) Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
(b) Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
(c) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

(2) Remove and replace malfunctioning units and retest as specified above.

d. STARTUP SERVICE

(1) Engage a factory-authorized service representative to perform startup service.

(a) Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION 15855

## SECTION II - PRICE DATA

### 2.1 PRICING:

A. TABLE A is to show unit price and total price for each item listed.

B. A grand total is to be placed at the end of the total column and on the STATE's bid price sheet commodity line 01.

C. Installation charge is to be included on the STATE's bid price sheet commodity line 02.

### 2.2 HARDWARE MAINTENANCE PRICE TABLE:

A. The following price TABLE B is required for the hardware configuration bid.

B. Include on STATE's bid price sheet commodity line 04 the monthly charge for maintenance for the hardware configuration bid during the first year period (year one).

## 2.3 MISCELLANEOUS COSTS:

A. Include on STATE's price sheet commodity line 03 if there are any miscellaneous charges (cables, wiring, etc.).

B. Include in ITB response a detailed listing and price of any associated costs.

**TABLE A**

| Product | Description | Qty | Unit Price | Total |
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| | | | **Grand Total** | |

**TABLE B**
**HARDWARE MAINTENANCE**

**II. HARDWARE MAINTENANCE TABLE:** Maximum annual increases bid in this table become part of any contract resulting from this bid. If a Contractor does not respond to this table, the maximum increases will be ruled to be zero (0) and said amount (zero) will become part of any contract resulting from this bid.

| CONTRACT YEAR FOR MAINTENANCE COST DETERMINATION | PREVIOUS YEAR'S MONTHLY $ | X | MAXIMUM PERCENTAGE INCREASED QUOTED FOR YEAR OF CONTRACT | = | INITIAL MONTHLY AMOUNT OR INCREASED MONTHLY AMOUNT | X | NUMBER OF MONTHS OR 12 MONTHS | = | FULL YEAR TOTAL FOR ON-SITE MAINT. 24X7 WITH 2 HOUR RESPONSE |
|---|---|---|---|---|---|---|---|---|---|
| 1ST YEAR EXPENSE FOR NON-WARRANTY PPM* TIME PERIOD (Enter # of Months) | XXXXXXXXX | X | XXXXXXXXX XXXXXXXXX XXXXXXXXX XXXXXXXXX | = | $ | X | | = | $ |
| 2ND YEAR PPM MAINT. | $ | X | % | _ | $ | X | 12 | = | $ |
| 3RD YEAR PPM MAINT. | $ | X | % | _ | $ | X | 12 | = | $ |
| 4TH YEAR PPM MAINT. | $ | X | % | _ | $ | X | 12 | = | $ |
| 5TH YEAR PPM MAINT. | $ | X | % | _ | $ | X | 12 | = | $ |
| TOTAL MAINTENANCE EXPENSE (For 5 Years) | | | | | | | | | $ |