

MEA No.: 181001

SECTION 15000 - HVAC – GENERAL

1.1 GENERAL

- A. Applicable requirements of the Contract Documents, preceding the Technical Specifications, apply to this Section. In the event of conflict between the Specifications, the most stringent shall apply.
- B. Separation of these Specifications into Divisions and Sections is for convenience only and is not intended to establish limits of work.
- C. Consult index to be certain that set of Documents and Specifications is complete. Report omissions or discrepancies to the Owner's Representative.
- D. The Contractor shall employ high standards of good workmanship and shall pay special attention to the safety of the equipment. The installation of material and equipment shall be in conformance with the codes and standards listed in Paragraph: STANDARDS. The agency having the most stringent requirements shall be adhered to.
- E. The Contractor shall make a thorough examination of the site and shall make due allowances for difficulties and contingencies to be encountered. All dimensions shall be checked and verified by the Contractor at the site.
- F. The Contractor and all Sub-Contractors shall have a minimum of three years proven experience on projects with similar levels of complexity and magnitude. Experience shall be based on the experience as a company and not on the experience as individuals.
- G. The Drawings and Specifications are intended to function as a common set of documents. Anything shown on the Drawings but not mentioned in the Specifications or mentioned in the Specifications and not shown on the Drawings shall be equally binding as if both noted on the Drawings and called for in the Specifications.

1.2 SCOPE

- A. The work covered by and included in these Specifications consists of the furnishing of all materials, all equipment, labor, tools and supervision and performing all operations necessary for the proper and complete execution of the Heating, Ventilating and Air Conditioning work in strict accordance with the Specifications and the Drawings and subject to the terms and conditions of the Contract.

1.3 DEFINITIONS

- A. The term "Contractor" or "HVAC Contractor" or "Mechanical Contractor" when used in this Specification refers to the Contractor responsible for all work under this Section.
- B. The term "Provide" refers to this Contractor purchasing, delivering and installing as a part of this Contract.
- C. The term "HVAC" refers to Heating, Ventilating and Air Conditioning.
- D. The term "ATC" refers to Automatic Temperature Controls.

1.4 STANDARDS

- A. Meet requirements and recommendations of applicable portions of the latest edition of all codes and standards, as adopted by the local authority having jurisdiction, including those listed.
1. Air Movement and Control Association Standards (AMCA)
 - a. 210 Laboratory Methods of Testing Fans for Rating Purposes
 - b. 230 Laboratory Methods of Testing Air Circulator Fans for Rating
 - c. 500-D Laboratory Methods of Testing Dampers for Rating
 - d. 500-L Laboratory Methods of Testing Louvers for Rating
 - e. 511 Certified Ratings Program for Air Control Devices
 2. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
 - a. 52 Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
 3. 90.1 2007 Energy Efficient Design for New Building
 4. American National Standards Institute Standards (ANSI)
 - a. ANSI/ASME B16.5 Pipe Flanges and Flanged Fittings
 - b. ANSI/ASME B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
 5. American Society of Mechanical Engineers (ASME)
 - a. Boiler and Pressure Vessel Code and Interpretations Section VIII; Unfired Pressure Vessels (latest edition with addenda)
 6. American Society for Testing and Materials Standards (ASTM)
 - a. A-181 Carbon Steel Forgings For General Purpose Piping
 - b. A-234 Piping Fittings of Wrought Carbon Steel and Alloy Steel For Moderate and High Temperature Service
 - c. A-53 Welded and Seamless Steel Pipe
 - d. B-88 Seamless Copper Water Tube
 - e. E-84 Surface Burning Characteristics of Building Materials
 - f. C-411 Test Method for Hot Surface Performance of High Temperature Thermal Insulation

7. American Welding Society Standards (AWS)
 - a. B3.0 Qualification Procedure
8. The Uniform Construction Code (PA)
9. International Mechanical Code 2009 (IMC)
10. International Building Code 2009 (IBC)
11. International Energy Conservation Code 2009 (IECC)
12. National Fire Protection Association Standards (NFPA)
 - a. 70 National Electrical Code (NEC)
 - b. 90A Installation of Air Conditioning and Ventilating Systems
 - c. 96 Ventilation Control and Fire Protection of Commercial Cooking Operations
 - d. 255 Surface Burning Characteristics of Building Materials
13. The Hydronics Institute Publications (HI) I=B=R Testing and Rating Code for Finned Tube (Commercial) Radiation (latest edition)
14. Occupational Safety and Health Administration (OSHA)
15. Public Law 101-336, The Americans with Disabilities Act of 1990
16. Sheet Metal and Air Conditioning Contractors National Association, Inc., Publication (SMACNA)
 - a. HVAC Duct Construction Standards: Metal and Flexible, Second Edition
 - b. Seismic Restraint Manual: Guidelines For Mechanical Systems, Second Edition
17. Air Conditioning and Refrigeration Institute (ARI)
 - a. ANSI/ARI 210/240 Unitary Air Conditioning Equipment and Air Source Heat Pump Equipment
 - b. ANSI/ARI 410 Forced Circulation Air-Cooling and Air-Heating Coils
 - c. ANSI/ARI 430 Central Station Air Handling Units
 - d. ANSI/ARI 550 Centrifugal and Rotary Screw Water-Chilling Packages
18. Underwriters Laboratories Publication (UL)
 - a. 1025 Electric Air Heaters
 - b. 1995 Heating and Cooling Equipment

19. Regulations of the Pennsylvania State Police, Fire Marshall Division

20. Pennsylvania Department of Labor and Industry, Fire and Panic Regulations

- B. Should any change in the Drawings and/or Specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, the Owner's Representative shall be notified prior to the time of submitting bids.

1.5 NOTIFICATION

- A. Trades that have work connected with the heating, ventilating and air conditioning work and trades that do preparatory work for heating, ventilating and air conditioning shall be notified for installation requirements and scheduling.
- B. The Owner's Representative shall be informed of the installation schedule to allow sufficient time for inspection without any work delay.
- C. All work shall be coordinated to avoid cutting of work in place and interfering with other operations.

1.6 CONTRACT DRAWINGS

- A. Contract Drawings are diagrammatic and indicate the relation of piping, ductwork, connections and equipment. The Drawings do not indicate all offsets, elbows and fittings that may be required. Therefore, the Contractor shall carefully investigate the structural and finish conditions affecting the work. The Contractor shall furnish all offsets, elbows, fittings, hangers and accessories as may be required to meet these conditions at no additional cost to the Owner.
- B. Do not scale the Drawings. The Contractor shall check conditions at the site for dimensions and sizes pertaining to the structure.
- C. Do not deviate from the Drawings without prior approval.

1.7 LINES, GRADES AND SURVEYS

- A. All necessary surveys, lines, grades and measurements are the responsibility of the Contractor desiring the information for the proper installation of his work. The Contractor is responsible for the proper installation of the work with respect to other Contractors.
- B. Grades, elevations and locations shown on the Drawings are approximate and the Contractor shall check all such information on the site before proceeding with the work.

1.8 WORKMANSHIP

- A. All equipment, piping, conduit, insulation, fixtures, etc. shall be installed meeting the accepted standards of the representative industry.
- B. All work to be performed shall be done by qualified mechanics. All mechanics in the employ of this Contractor on this project shall be skilled in the phases of the work to which they are used. The mechanic's affiliation with labor organizations shall be acceptable to all trades employed on the project.

1.9 BRAND NAME OR EQUAL

- A. If an item in this solicitation is identified as “brand name or equal,” the purchase description reflects the characteristics and level of quality that will satisfy the Government’s needs. The salient physical, functional, or performance characteristics that “equal” products must meet are specified in the solicitation.
- B. To be considered for award, offers of “equal” products, including “equal” products of the brand name manufacturer, must:
 - 1. Meet the salient physical, functional, or performance characteristic specified in this solicitation.
 - 2. Clearly identify the item by:
 - a. Brand name, if any
 - b. Make or model number.
 - 3. Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer.
 - 4. Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.
- C. The Contracting Officer will evaluate “equal” products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer.
- D. Unless the offeror clearly indicates in its offer that the product being offered is an “equal” product, the offeror shall provide the brand name product referenced in the solicitation.

1.10 SUBMITTAL PROCEDURES

- A. Transmit each submittal with an Owner's Representative's accepted form. Include one copy each for the Owner and the Owner's Representative in addition to copies required by the Contractor.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, Sub-Contractor or Supplier; pertinent Drawing sheet and detail number and Specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents.
- E. Incomplete submittals shall not relieve the Contractor of providing a complete and functional system.
- F. Schedule submittals to expedite the Project. Coordinate submission of related items.
- G. Submittals by the Contractor must be in complete compliance with the Contract Documents unless exceptions are identified. Exceptions to the Contract Documents may

only be made to improve the project. Exceptions cannot be taken which would provide an incomplete and/or nonfunctional system.

1. Exceptions must be included in/on the submittal in a separate paragraph or drawing block located below the Contractor's stamp identified by the title "Exception to Contract Documents." Exceptions cannot be part of the standard Contractor's stamp.
- H. Provide space for Contractor and Owner's Representative review stamps.
- I. The Owner's Representative will return Shop Drawings with the following designations:
1. Reviewed: Further submission not required.
 2. Reviewed as Noted: Corrections must be incorporated in final installation. Further submission not required unless specifically noted.
 3. Review Not Required: Placed in project files for information only.
 4. Revise and Resubmit: Make necessary changes and resubmit prior to fabrication.
 5. Rejected: Does not meet project requirements. Resubmit in accordance with Contract Documents.
- J. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- 1.11 SHOP DRAWINGS/PRODUCT DATA
- A. Submit manufacturer's installation instructions.
 - B. Submit Shop Drawings and/or catalog cuts for all specified materials and equipment, piping layouts and ductwork layouts.
 - C. Submit Shop Drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
 - D. Mark dimensions and values in units to match those specified.
 - E. Show equipment sizes and locations, by dimensions, of ducts, equipment and other items.
 - F. Include wiring diagrams, hole location and sizes and other data that could affect work by other trades.
 - G. Show manufacturer's names, trade names, catalog numbers, accessories, special features and rating data.
 - H. Indicate required clearances for operating parts, for removal and for servicing.
 - I. Show performance data, including fan and pump curves.
 - J. Show sound power levels of all rotating equipment.

- K. Indicate efficiencies and air leakage rates for filters and filter housings.

1.12 SUBSTITUTIONS

- A. Any bidder wishing to substitute "or equal" equipment may request a substitution. Manufacturers which are submitted as substitutions for approved equal status are considered to have equipment of similar quality; however, the Contractor shall not assume that a piece of equipment by a manufacturer submitted as a "substitution" will be automatically accepted. Compliance with the Drawings and Specifications is still required. If the substituted material is considered to be unacceptable, the Contractor shall provide the equipment as originally specified.
- B. Substitutions are encouraged when there is significant cost savings or an improvement to project. Submit reasons for changes with any requests for substitution. All requests for substitutions must be made within 30 days of contract award unless stated otherwise in the General Conditions.
- C. Bid alternates shall be clearly defined on the bid forms in order to be evaluated during the bidding process.
- D. By submitting an alternate or substitution, the Contractor automatically agrees to the following:
 - 1. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative to review the substituted materials, in accordance with the then current Owner's Representative's hourly rate.
 - 2. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative for field or office conferences caused by the substituted materials in accordance with the then current Owner's Representative's hourly rate.
 - 3. The consideration of alternates/substitutions does not obligate the Owner's Representative to accept same.
 - 4. In the event a brand is approved and substituted, it is the responsibility of the Contractor to so coordinate his substituted material into the original work at no extra cost to the Owner or any other Contractor.

1.13 CUTTING AND PATCHING

- A. The Contractor shall engage the services of a qualified General Contractor (as a Sub-Contractor) and shall provide complete information to this 'Sub' as to size of openings required in floors and walls, etc., so that such openings may be provided as the project progresses.
- B. All cutting and patching of every nature required in connection with this Contract shall be done by the Contractor with mechanics experienced in their respective lines of work. All patching shall match adjacent finishes.
- C. All cutting in the building shall be done with great care so as not to leave an unsightly surface, which may not be concealed by plates, escutcheons or other normal concealing construction. If such unsightly conditions occur, the Contractor shall be required, at his own expense, to engage the General Contractor to replace the damaged materials with new materials.

1.14 CONCRETE AND MASONRY WORK

- A. Unless otherwise noted, all concrete bases, reinforcing, etc. and masonry work required to install the respective Contract Work shall be furnished and installed by the respective Contractor.
- B. The Contractor shall furnish all materials, labor, equipment and tools necessary to complete concrete work.
- C. Contractor shall provide minimum of four-inch thick concrete bases under all floor mounted equipment.
- D. Contractor shall provide a minimum four inch thick concrete pad on six inches of 3/4 inch crushed stone for each outdoor condensing unit or heat pump.
- E. All concrete work shall comply with the requirements of the ACI Building Code (ACI 318), the ACI Detailing Manual (ACI 315) and the Specifications for Structural Concrete for Buildings (ACI 301).
- F. If cold weather construction is required, freeze protection must be provided for all concrete. The subgrade cannot be frozen. The concrete must be treated and blankets must be used during curing. All the requirements of ACI 306R must be followed. Any contractor not experienced in cold weather concrete construction shall obtain a copy of the most recent version of ACI 306R and take all precautions prescribed therein.
- G. All reinforcing steel shall be manufactured from high strength billet steel conforming to ASTM Designation A-615, Grade 60. WWF shall comply with ASTM A-185.

1.15 MATERIALS

- A. All materials and equipment provided by this Contractor shall be new, without imperfections and blemishes and shall be protected from the elements prior to installation in building.
- B. All equipment shall be tested, listed and labeled by an approved authority (UL, AGA, ETL) and shall be installed in accordance with its listing. Installation instructions shall be available at the job site.
- C. All equipment subject to specific requirements of the Owner's insurance company (gas trains, etc.) shall meet the insurance companies requirements.

1.16 METHODS

- A. The HVAC Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the Drawings. Ductwork, piping or equipment improperly placed because of the HVAC Contractor's failure to obtain this information shall be relocated and reinstalled by the HVAC Contractor without additional expense to the Owner.
- B. Each Contractor, upon request of the Owner's Representative shall expedite the work of a specific area, section or part of the project to permit the installation of another part of the work.

- C. All ductwork, piping, accessories and equipment shall be installed in such a manner as to preserve access with sufficient space provided for proper operation and maintenance to any existing equipment or to any new equipment installed under this Specification or under other Specifications or Contracts for this building.
- D. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts, equipment, architectural or structural features will be avoided. In the case interference results, the Owner's Representative shall decide which work is to be relocated, regardless of which is first installed. Such relocation shall be at no additional cost to the Owner.
- E. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building structure where required.
- F. All items of labor, material and equipment not specified in detail or shown on the Drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Specifications or Drawings.
- G. The Contractor shall provide isolation valves and unions or flanges at all pieces of equipment and at all branch take-offs serving five or more pieces of equipment (whether indicated or not) to facilitate replacement or service of the equipment.
- H. All equipment shall be installed in accordance with the manufacturer's recommendations and installation instructions. The manufacturer's installation recommendations and instructions shall be considered part of this Contract.
- I. Any questions regarding means or methods of construction shall be addressed during the bidding phase of the project.

1.17 SCHEDULING OF WORK

- A. The Contractor shall attend all planning meetings, provide scheduling information and work with all trades to obtain a workable project schedule that meets the Owner's requirements.

1.18 PROTECTION

- A. Each Contractor shall effectively protect his work and materials with tarpaulins or heavy plastic material against dirt, water, chemicals, plaster or damage during the entire period of installation or until he is directed to remove the coverings by the Owner's Representative. Any damaged material must be removed and replaced by the Contractor without additional cost regardless of the cause of the damage. All openings in pipes, fittings, ductwork, etc. must be effectively sealed to exclude dirt, sand and other foreign substances.

1.19 PROTECTION OF OWNER'S EQUIPMENT

- A. The Contractor shall provide any temporary work required to protect the Owner's equipment and to contain the dust generated during construction. Any measures taken by the Contractor for the protection of equipment shall be installed to the satisfaction of the Owner or the Owner's Representative, which may include any and all provisions listed in DIVISION-1: GENERAL REQUIREMENTS and/or in accordance with the appropriate Technical Specifications for wood and plastics in DIVISION-6. An approved protection material is nylon reinforced flame retardant and anti-static Griffolyn T-75 ASFR 8 mil film. Telephone No. 1-800-231-6074.

1.20 WORK IN THE EXISTING BUILDING

- A. The HVAC Contractor shall be responsible for thoroughly surveying the existing building to determine the extent and cost of installing new equipment and materials in the existing building.
- B. All new equipment and materials shall be installed in the existing building as herein specified.
- C. All Contractors, before starting any cutting of the present building, must first obtain approval from the Owner's Representative on the site before cutting at each location. This Contractor shall provide any temporary work required to retain the dust generated by his work as may be directed by the Owner's Representative. All dust found, which has escaped the area of cutting, shall be properly removed by the Contractor without additional cost to the Owner.
- D. All openings cut into the exterior of the existing structure must be completely sealed and waterproofed before leaving the job site each day. This shall be done by the Contractor responsible for the cutting.
- E. Contractor should not assume utilities can be installed as shown. Drawings are diagrammatic and utilities may need to shift to accommodate existing conditions. In some cases equivalent duct sizes may be required to be used or relocating and existing utility may expedite or simplify construction. It is believed that in general the project can be constructed with utilities in approximately the locations as shown.
- F. Construction phasing could require installation of some temporary feeds and system shutdowns to accommodate construction.

1.21 INTERRUPTION OF SERVICES

- A. The Contractor shall schedule his work to avoid any interruption of any utility services to the operation areas of the building during normal working hours. Interruption of services shall be done during off hours at no additional cost to the Owner.
- B. The Contractor shall notify the Owner and the Owner's Representative at least three days prior to any interruption of services. The scheduling of all interruptions shall be approved by the Owner.

1.22 RUBBISH REMOVAL AND CLEANUP

- A. Each Contractor is responsible for periodic removal of all rubbish resulting from his work. All surplus material, refuse, rubbish, etc., shall be removed from the job site at completion of Contract. The Owner's Representative must be satisfied with the removal and cleanup.

1.23 DELIVERING AND STORAGE OF MATERIALS AND EQUIPMENT

- A. Deliver accessories, small-unmarked parts, adhesives and incidental items to the site in manufacturer's original, unopened, labeled containers.
- B. Store materials and equipment to prevent damage and injury. Store ferrous materials to prevent rusting. Store equipment to prevent staining and discoloring.

1.24 AS-BUILT DRAWINGS

- A. During construction, the Contractor shall maintain a record set of red lined installation prints. He shall record on these prints, all deviations from the Contract Drawings in pipe sizing, duct sizing, equipment, pipe or duct location, depth of pipe cover and details.
- B. At the completion of the work, the Contractor shall transfer this information neatly onto clean prints and forward them to the Owner's Representative.

1.25 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Prior to completion of this project, the Contractor shall deliver to the Owner's Representative for approval three copies of an Operating and Maintenance Manual consisting of items outlined hereinafter.
- B. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, troubleshooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.
- C. The manual shall include the following:
 - 1. Manuals shall be bound, 8-1/2 x 11 inch text pages and set in three-ring binders with durable covers.
 - 2. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project and subject matter of binder when multiple binders are required. All subject matter shall be in typewritten format.
 - 3. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab labeling clearly printed under reinforced laminated plastic tabs.
 - a. Contents: Prepare a Table of Contents for each volume with product or system description identified, type on white paper.
 - b. Part 1: Directory, listing names, addresses and telephone numbers of Owner's Representative, Contractor, Sub-Contractors and major equipment suppliers.
 - c. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses and telephone numbers of Sub-Contractors and suppliers. Operating and start-up instructions shall be written in a concise step-by-step manner. Maintenance instructions shall include maintenance schedules, procedures, adjustments and troubleshooting techniques. All non-pertinent information in the manuals shall be either eliminated or crossed out in a neat and thorough manner. Identify the following:
 - 1) List of equipment
 - 2) Parts list for each component
 - 3) Operating instructions
 - 4) Maintenance instructions for equipment and systems
 - d. Part 3: Project documents and certificates, including the following:
 - 1) Corrected shop drawings and product data
 - 2) Control wiring diagrams

- 3) Certificates
 - 4) Photocopies of warranties
- e. Submit one copy of completed volumes in final form 30 days prior to final inspection. This copy will be returned after final inspection, with the Owner's Representative's comments. Revise content of documents as required prior to final submittal.
 - f. Submit final volumes revised, within ten days after Owner's review.

1.26 PAINTING

- A. Where factory finishes are provided and no additional field painting is specified; all marred or damaged surfaces shall be touched up or refinished to a smooth and uniform finish.
- B. All exposed ferrous metalwork, pipe, supports, hangers, insulation, exterior equipment including aluminum and other surfaces not factory painted shall be painted with one prime and two finish coats. Paint, surface preparation and application shall be as specified in Section: PAINTING. Colors shall match existing work or shall be as selected by the Owner's Representative.

1.27 LAWS, ORDINANCES AND REGULATIONS

- A. All systems in all and/or part shall conform to all pertinent laws, ordinances and regulations of ALL bodies having jurisdiction, at all governing levels. In case of conflict between governing levels, the more stringent law shall apply. As a minimum, all work shall comply with IMC, IBC, NFPA, OSHA, SMACNA and Pennsylvania Labor & Industry requirements.
- B. The Contractor shall pay all fees, prepare and submit all utility applications and obtain and pay for all permits, inspections, and certifications required for his work including L&I boiler room plans and L&I inspections and approvals.

1.28 BUILDING EXPANSION JOINTS AND FIRE RATED ASSEMBLIES

- A. Provide expansion joints in ductwork and piping where they cross building expansion joints.
- B. Provide fire dampers in all penetrations through fire rated floors, walls and partitions and provide ceiling radiation dampers in penetrations through fire rated ceiling assemblies as required to maintain the necessary fire rating and/or UL rating of the assembly.
- C. Meet all requirements of Underwriter's Laboratories and all applicable codes for maintaining the integrity of all fire rated assemblies.
- D. Seal space around ducts, pipes or conduits with approved fireproof material where they pass through fire rated assemblies.
- E. Contractor shall engage the services of a fire protection contractor to review the drawings and install fire protection products to maintain the integrity of all pipe, wire, conduit, duct, diffuser, register, grille, etc. penetrations through any and all fire rated walls, floors, barriers, and assemblies. Fire stop training and products shall be 3M or approved equal.

1.29 ACCESS DOORS

- A. The Contractor shall provide access panels/access doors for access to dampers, valves, controllers or any other equipment or component requiring access for maintenance, adjustment or service wherever these items are concealed in building walls, partitions or ceilings. Frames shall be anchored in walls, partitions or ceilings and shall be set true to lines of the building and flush with the finished surfaces. Access panels/access doors shall be as specified in the General Construction Sections of the Specifications.

1.30 FASTENING, SUPPORTS AND HANGERS

- A. All fastenings, supports, hangers, miscellaneous steel, clamps and anchors shall be of the type made for the specific purpose for which they are to be used. Toggle bolts or machine bolt fastenings shall be used for hollow tile, terra cotta or lath construction. Machine screws shall be used for structural steel fastenings. Lead expansion shield and machine screws or lag screws shall be used for solid masonry fastening. Lag screws shall be used for wood fastening. All equipment, piping and ductwork shall be rigidly and firmly installed to prevent swaying, vibrating or sagging by malleable or wrought steel hangers of standard design, pipe clamps or fabricated steel supports of approved design. Hangers of horizontal piping runs shall be adjustable clevis-type. Perforated strap iron hangers and caddy clips are not permissible.

1.31 CONCRETE INSERTS

- A. The HVAC Contractor shall provide and install concrete inserts of an approved carbon steel wedge-type for all hangers. Where two or more parallel pipes are installed continuous inserts may be used. Where required to distribute the load on the inserts, a piece of reinforcing steel of sufficient length shall be passed through the insert. Each insert shall include a knockout piece. Inserts shall have a minimum safety factor of five.

1.32 SLEEVES

- A. The HVAC Contractor shall provide and install sleeves where required to protect equipment or facilities in the installation. Each sleeve shall extend through its respective floor, wall or partition and shall be cut flush with each surface unless otherwise required.
- B. Sleeves in bearing and masonry walls, floors and partitions shall be of standard weight steel pipe, finished with smooth edges. For other masonry partitions, through suspended ceilings and for concealed vertical piping, sleeves shall be No. 22 U.S.G. galvanized iron.
- C. All sleeves shall be properly installed and securely cemented in place.
- D. Floor sleeves shall extend one-inch above the finished floor. Space between floor sleeves and passing conduit shall be caulked with an approved graphite packing or waterproof caulking compound.
- E. Where pipes pass through waterproofed floors or walls, design of sleeves shall be such that waterproofing can be flashed into and around the sleeves.
- F. Where pipes, ducts or conduits pass through fire resisting portions of the structure, the annular space between the sleeve and the pipe, duct or conduit shall be filled with an approved fireproof material as required to maintain the fire rating of that portion of the structure.

1.33 FIRE STOPPING

- A. The contractor shall be responsible to provide and install fire-stopping materials and/or systems where his work penetrates fire and/or smoke rated portions of the building and non-fire resistance-rated assemblies. All materials used shall be manufactured such that they are intended to resist the spread of fire and the passage of smoke. This includes but is not limited to rated walls, floors, shafts, ceilings, and non-fire resistance-rated horizontal assemblies. All fire stopping materials used shall have a fire resistance rating equal to or greater than the rated assembly for which they are installed.
- B. For locations where the installed fire stopping material is exposed to normal view, the contractor shall conceal the material with chrome-plated escutcheon plates or other materials that have a flame-spread value of 25 or less and a smoke developed rating of 50 or less, as determined per ASTM E 84. The concealing device shall be approved by the owner's representative prior to installation. Provide shop drawings for each device.
- C. The contractor shall provide components/accessories for each fire-stopping system that are needed to install fill materials and to comply with all system performance requirements as recommended by the fire stopping material manufacturer. Accessories include but are not limited to: mineral wool insulation, ceramic fiber, sealants used to aid in the formation of the fire stopping materials, fire-rated formboard, joint fillers and sealers, collars and steel sleeves.
- D. Fire stopping materials and systems shall include, but are not limited to, the following: fire barrier caulk and sealants, intumescent caulk, intumescent putty, intumescent wrap strips, silicone foams and sealants, fire barrier composite sheets and cast-in-place fire barrier systems.
- E. Fire stopping materials and systems shall as manufactured by 3M Fire Protection Products , Hilti Corporation, ProSet Systems Inc.

1.34 ANCHOR BOLTS

- A. The Contractor shall provide and set in place, at the time of pouring of concrete foundations, all necessary anchor bolts as required for the equipment called for in these Specifications. Anchor bolts shall be of the hook-type, of proper size and length to suit the equipment. Anchor bolts shall be set in pipe sleeves of approximately twice the bolt diameter and one half the embedded length of the bolt. The Contractor shall assume full responsibility for proper coordination and placement of the bolts. Upon completion of equipment installation, pipe sleeves shall be caulked in accordance with Paragraph: "SLEEVES" in this Section of the Specifications.

1.35 DEMOLITION

- A. The Contractor shall perform all demolition work as indicated on the Drawings and as described below as part of this Contract.
- B. The Contractor shall cut and patch as required to perform the demolition work. All openings created must be repaired to match existing conditions.
- C. All cutting and patching shall be performed by mechanics experienced in their respective line of work. If the Owner's Representative is not satisfied with quality of work, the Contractor shall be required, at his own expense, to engage the General Contractor to replace damaged materials with new materials.

- D. The Owner shall be given the opportunity to retain ownership of all removed materials and equipment. All such items shall be carefully handled and protected and shall be stored by this Contractor at the site as directed by the Owner. Any such materials and equipment not desired by the Owner shall become the property of the Contractor and shall be removed promptly from the project site. Disposal shall be in accordance with the regulations of the authorities at the disposal site.
- E. If the Contractor encounters or suspects hazardous or toxic material, the Contractor shall advise the Owner immediately. The work in the affected area shall not be resumed by the Contractor until the hazardous material has been removed or rendered harmless by the Owner.

1.36 WARRANTY

- A. The systems specified herein shall be guaranteed to be free from defects in workmanship and material under normal use and service for a period of one year (five years for all compressors) from date of substantial completion.
- B. If, within the aforementioned warranty period, any material specified herein is proven to be defective in any way, it shall be replaced or repaired at no additional cost to the Owner. Warranty shall include providing of all labor and materials necessary for repair or replacement of any defective components. The Contractor is responsible for costs of any services required by equipment suppliers that are not included in suppliers' warranties.
- C. The Contractor shall, after acceptance of the installation by the Owner or the Owner's Representative, provide any service incidental to the proper performance of the systems under the warranties outlined above for the time periods listed above.

END OF SECTION 15000