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**SECTION 22 00 00**  
**PLUMBING COMMON WORK RESULTS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Fire Protection work shall include all final connections and flexible connections to the fire protection system and to related equipment by others, as well as connections serving the fire protection systems (site connections, water connections, indirect waste connections, fire department connections, etc.) and external systems as required.
- B. Plumbing work shall include all final connections and flexible connections to the plumbing system and to related equipment by other, as well as, connections serving the plumbing systems (site connections, make-up water connections, indirect waste connections, etc.).

**1.2 RELATED REQUIREMENTS**

- A. Division 01 - General Requirements.
- B. Section 01 00 00 - General Requirements.
- C. Section 01 30 00 - Administrative Requirements.
- D. Section 01 51 00 - Temporary Utilities.
- E. Section 22 00 00 - Plumbing Common Work Results; for Closeout Submittals.
- F. Division 03 - Concrete.
- G. Division 05 - Metals.
- H. Section 07 84 00 - Firestopping.
- I. Section 07 90 05 - Joint Sealers.
- J. Section 08 31 00 - Access Doors and Panels.
- K. Section 09 90 00 - Painting.
- L. Section 22 10 06 - Plumbing Piping
- M. Division 31 - Earthwork.

**1.3 REFERENCE STANDARDS**

- A. ASME (BPV) - Boiler and Pressure Vessel Code; American Society of Mechanical Engineers; 2013.
- B. ASME B18.10 - Standard for Bolt and Nuts.
- C. ASTM A36 - Standard Specification for Carbon Structural.
- D. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.
- E. ASTM A307 - Carbon Steel Bolts and Studs.
- F. ASTM C881 - Standard Specification for Steel Wire.
- G. ASTM F844 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use , carbon steel, plain, steel, washers.
- H. AWS D1.1 - Structural Welding Code--Steel.
- I. AWWA C651 - Disinfection of Water Mains.
- J. AWWA C652 - Disinfection of Storage Facilities.
- K. Pennsylvania Plumbing System Lead Ban & Notification Act (No. 33-1989).
- L. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

**1.4 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

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- B. Submittal Naming: Submittals shall be identified through a numbering system. Throughout Division 22, submittal numbers are proposed for the mandatory submittals. The numbers are (## ## ## - ### - L).
1. ## ## ## Is the section number or drawing number referenced for the submittal.
    - a. A specification section would be referenced using all of the number for the spec section, it is not limited to just 6 digits.
    - b. A drawing would be referenced as MH601.
  2. - indicated a hyphen at the end of the section or drawing number.
  3. ### a three number series. The first number is the contractor number. The next two numbers in the sequential number for the submittal for that section.
    - a. 0## - use through Division 22 for proposed number, contractor responsible for work to change when submitting.
    - b. 1## - Fire Protection Contractor.
    - c. 2## - Plumbing Contractor.
  4. - indicated a hyphen at the end of the three number series.
  5. L Starting with an A for the first submittal. Each re-submittal shall increase to the following letter.
- C. Listed manufacturers and series are for reference only and do not promote any single product. Series are provided for reference, and should not be used as an ordering model number. Accessories and options may be custom components purchased separately.
- D. Coordination Forms: Provide signed copies of all coordination form and exterior applications for services.
1. Fire Protection - Submit copy of application to owner and utility company.
  2. Domestic Water - Submit copy of application to owner and utility company.
  3. Sanitary Sewer - Submit copy of application to owner and utility company.
- E. Product Data: Provide manufacturer's most current catalog data sheet for equipment indicating rough-in size, finish, and accessories. Manufacturer's data sheets on each item of equipment and device, shall be clearly marked up to identify the items, accessories and options to be used on the project.
1. Access panels (20 00 00 - 001 - A)
  2. Fire sealants (20 00 00 - 002 - A)
  3. Pipe portals (20 00 00 - 003 - A)
- F. Shop Drawings: Indicate materials used, jointing methods, supports, floor, and wall penetration. Indicate installation, layout, weights, mounting and support details, and connections.
1. Access panels (20 00 00 - 001 - A)
  2. Fire sealants (20 00 00 - 002 - A)
  3. Pipe portals (20 00 00 - 003 - A)
- G. Coordination Drawings: Indication locations for products and resolve conflicts with other trades.
1. Refer to Section 22 00 00 - Plumbing Common Work Results; for general coordination drawings guidelines. Refer to paragraph below for drawing contents.
  2. Coordination Drawings (20 00 00 - 004 - A)
- H. Project Record Documents: Record actual installed locations of components and tag numbering.
1. Refer to Section 22 00 00 - Plumbing Common Work Results.
  2. Record Documents (20 00 00 - 005 - A)
- I. Operation and Maintenance Data: Include installation instructions and spare parts lists.
1. Refer to Section 22 00 00 - Plumbing Common Work Results.
  2. Operation and Maintenance Data Books (20 00 00 - 006 - A)
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## 3. Operation and Maintenance DVD

(20 00 00 - 007 - A)

**1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
  - 1. Submittal of documented experience, submitted upon request by Architect.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
  - 1. Minimum three years experience. Submittal of documented experience, submitted upon request by Architect.
  - 2. Approved by manufacturer. Submittal of approval, submitted upon request by Architect.
- C. Conform to UL, FM, and Warnock Hersey requirements.
- D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store products in shipping containers, with labeling in place.
- B. Provide temporary protective coating on products.
- C. Provide temporary end caps and closures on duct, piping, equipment and fittings. Maintain in place until installation.
- D. Protect products from weather and construction traffic, dirt, water, chemical, and mechanical damage.
- E. Protect installed fixtures and equipment from damage by securing areas and by leaving factory packaging in place to protect equipment and fixtures and prevent use of equipment and fixtures.

**1.7 CODES AND STANDARDS**

- A. Work is subject to provisions of the International Building Code and has been designed to be in compliance with the Code. Design aspect of the Project shall not be altered regarding building envelope or selection of domestic water systems and equipment. Supplemental data published by equipment and system manufacturers to substantiate energy conservation efficiencies throughout the Project shall be furnished at request of Architect.
- B. Work shall meet requirements of the FM Global, National Fire Protection Association, all Federal, State, and Municipal authority's laws, rules and regulations applicable to the Work and public utilities having jurisdiction over systems specified herein.
- C. Domestic Water Heater(s) and Pressure Vessels shall be constructed and tested in accordance with recommendations of the National Fire Protection Association, Pennsylvania Department of Labor and Industry - Boiler Inspection Division, and ASME BPV code.
  - 1. Equipment shall be stamped with the ASME symbol and National Board number and shall be inspected during construction by an inspector who has been commissioned by the Pennsylvania Department of Labor and Industry to perform such service. Equipment shall be prepared for initial inspection in accordance with Department of Labor and Industry regulations.
- D. Plumbing Work shall be installed in conformity with applicable portions of the ASME Plumbing Code, International Plumbing Code, Pennsylvania Department of Environmental Protection, State Plumbing Codes, and Local Ordinances and shall be approved as project progresses by local authority having jurisdiction.
- E. Contractor shall certify domestic water systems for compliance with Pennsylvania Plumbing System Lead Ban & Notification Act (No. 33-1989).

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- F. Nothing in the Specifications shall be construed to permit deviation from requirements of any governing code(s).
  - G. Electrical Work shall meet requirements of the National Electrical Code and all Federal, State, and Municipal authority's laws, rules and regulations applicable to the Work.
  - H. Where applicable, materials and equipment shall bear the label of approval of Underwriters Laboratories, Inc.
  - I. Reference to codes and standards listed herein shall constitute minimum acceptable requirements. Where Drawings and Specification requirements exceed those of codes listed, Drawings and Specifications shall take precedence for Work of this Project.
  - J. If Contractor, during the course of work, observes the existence of hazardous materials in the structure or on the project site, Contractor shall promptly notify Owner and Architect. Contractor shall not perform any work pertinent to the hazardous material prior to receipt of special instructions from Owner. "Hazardous materials", for the purpose of this Specification, are defined as but not limited to asbestos, PCB's, petroleum, radioactive material, or any substance classified as hazardous waste substances.

#### **1.8 OWNER REQUIREMENTS**

- A. The contractor shall provide labor materials equipment and services and perform all operations required for completion of the work of this contract. This contract shall include the owner documented requirements as if included in whole.

#### **1.9 COORDINATION - UTILITIES**

- A. Fire Protection:
    - 1. Coordinate connection of Fire protection systems with local utility company.
      - a. Submit all required forms and requested information to utility company for application for service.
      - b. Coordinate on-site with local utility representative for pathways and requirements.
    - 2. Connect sprinkler piping to water-service piping for service entrance to building.
    - 3. Connect new sprinkler piping and riser pack as indicated on drawings.
    - 4. Comply with requirements for exterior piping. Refer to section 22 10 05 - Plumbing Piping
  - B. Domestic Water:
    - 1. Coordinate connection of domestic water systems with local utility company.
      - a. Submit all required forms and requested information to utility company for application for service.
      - b. Coordinate on-site with local utility representative for pathways and requirements.
    - 2. Connect cold water piping to water-service piping for service entrance to building.
    - 3. Comply with requirements for exterior piping. Refer to section 22 10 05 - Plumbing Piping.
    - 4. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.
    - 5. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.
  - C. Sanitary Sewer:
    - 1. Coordinate connection of sanitary systems with local utility company.
      - a. Submit all required forms and requested information to utility company for application for service.
      - b. Coordinate on-site with local utility representative for pathways and requirements.
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2. Connect sanitary piping to sewer piping for service entrance to building.
3. Comply with requirements for exterior piping. Refer to section 22 10 05 - Plumbing Piping.
4. Install house trap, bi-directional cleanouts, vents and other accessories at connection to sanitary-service piping.

#### **1.10 COORDINATION - SERVICE INTERRUPTION**

- A. Interruption of Existing Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service.
  1. Do not interrupt water service without Owner's written permission.
  2. Notify owner in writing, 10 days prior to service interruption. Notification must include the following:
    - a. Date and time for start of service interruption.
    - b. Utility company involvement, if required.
    - c. Itemization of each utility services impacted.
    - d. Work to be performed.
    - e. Time and duration of anticipated service interruption.
    - f. Arrangement of temporary service for anticipated shutdown.
    - g. Arrangement of temporary service for shutdown extending beyond shutdown time.
  3. Submit as RFI for approval.

#### **1.11 COORDINATION - GENERAL**

- A. Work shall be governed by requirements set forth in the conditions of the Contract.
- B. Provide all labor, materials, and equipment required by the Contract Documents necessary for completion of the Work.
- C. Bidders shall visit the project site to determine actual conditions which will be encountered in completing the work of this project.
- D. Drawings are generally indicative of work to be installed but may not indicate all bends, fittings, elbows, etc., required to meet conditions. Where items shown on the Drawings, or herein described, are not clearly understood, Bidders shall confer with Architect.
- E. Coordinate Work of Division 21 and 22 with that of other trades so that work will be installed in the most direct manner and so that interference between piping, ducts, conduits, equipment, and architectural or structural features will be avoided. Work installed in an arbitrary manner without regard for work of other trades or equipment servicing requirements will be rejected in any situation where an undesirable condition or an unfair hardship for other trades, or Owner, results. Removal of installed work and installation of re-work will not be charge to owner, Work shall be at the expense of Contractor.
- F. Provide sufficient scaffolding and hoist or rig material and equipment into place, or arrange for rigging by others. In any case, rigging or hoisting for Work shall be at the expense of Contractor.
- G. Unless otherwise indicated on the Drawings, provide structural steel members as required for support of equipment and materials furnished under Division 21 and 22. Provide all hangers and supports, as specified, detailed, or in accordance with accepted industry standards.
- H. Equipment shall be installed in accordance with equipment manufacturer's installation instructions unless otherwise required by code or specific instructions. Obtain manufacturer's installation instructions prior to roughing-in.

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- I. Where equipment is furnished by other trades for installation as Work under this Contract, or where electrical service or utility connection to equipment installed by others is indicated as Work of this Contract, obtain approved shop drawings and installation instructions from the respective contractor prior to roughing-in. Discrepancies between installation instructions and Contract Documents shall be brought to the attention of Architect.
  - J. Where equipment is indicated to be furnished as Work of this Contract for installation by others, or where equipment furnished and installed under this Contract requires utility connections by others, provide to the respective contractor one copy of an approved shop drawing and installation instructions necessary for execution of his work.
  - K. Unless specifically indicated, communication between the mechanical and electrical systems equipment and panels shall be via a dedicated wiring system furnished and installed by the systems installers. These systems shall be separate from all other data communication networks within the building. Contractor may request approval for providing communications on the Owner's building data network. If Owner's written approval is obtained, the system installer shall fully coordinate the necessary data network connections with the Owner, the Owner's technology consultant, and the contractor responsible for installing the building data network system.
    - 1. The systems shall follow the Owner's data network labeling scheme for outlets and jacks, operation protocols, and shall adhere to all network security measures.
    - 2. The system installer shall be responsible for all costs associated with equipment, materials, and labor necessary to furnish and install the communications network including, but not limited to: jacks, wall plates, cables, conduits and boxes, patch panels, patch cords, additional Owner switches and equipment, additional systems equipment and programming services.
    - 3. Bid shall include no connections.
    - 4. Submit as RFI with credit.

#### **1.12 COORDINATION - NEW CONSTRUCTION**

- A. Openings and recesses, including cutting, patching and finishing, necessary for installation of Work of this Contract in new construction will be provided by General Contractor. Coordinate locations, dimensional data, and scheduling of Work with General Contractor.
- B. Where piping is run concealed in concrete masonry unit (block) walls, Contractor shall be responsible for installing his work in cores of block for mason to wall-in as he carries up wall. Coordinate locations and scheduling of Work with General Contractor.
- C. General Contractor will provide concrete foundation pads for plumbing equipment. Provide General Contractor with approved shop drawing, dimensional data for size of base, and insert and anchor bolt locations. Method of setting, aligning, and anchoring shall be as recommended by equipment manufacturers. Unless noted otherwise, foundations shall be 6 inches above finished floor and extend a minimum of 6 inches beyond base or bed plate.

#### **1.13 COORDINATION - BASIS OF DESIGN**

- A. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.
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1. Refer to the General Conditions and Division 01 Specification Sections for the requirements of product substitution.
2. Where more than one manufacturer is named, only the first named manufacturer's item has been verified as suitable.

#### **1.14 COORDINATION - ELECTRICAL PANELS**

- A. Indicate all electrical, IT, telecommunication and data rooms at 1/4"=1 foot scale.
  1. Highlight any piping which crosses above an electrical panel, box or piece of equipment without another barrier between the elements.
- B. Coordination between trades and final room layout is to be provided.
  1. Where possible, piping shall not be installed above electrical panels, transformers or devices.
  2. Coordination between the trades shall ensure equipment locations and piping / ductwork locations are not in direct conflict.
  3. Install penetrations through walls to the sides of panels or above doorways where possible.
- C. Where piping is placed directly above an electrical panel, transformer or equipment, a secondary containment pan shall be provided.
  1. Drain pans shall be constructed of galvanized sheet metal.
  2. Drain pans shall overextend beyond pipe by 6" in each direction with a 1.5" minimum depth.
  3. Drain pans shall have a 1" drain connection extended to an indirect drain, mop receptor, or floor drain. Tag drain pipe with label for drain pan and location.
  4. Drain pan shall have a water sensor. Furnish and install water sensor and light / horn. Upon water being sensed, light and horn shall be energized. Alarm shall be tied to Building Automation System where Building Automation System is provided.
    - a. Water sensor Rectorseal Series AG-1250E.
    - b. Alarm Rectorseal Series AG-9100.
    - c. Power source Hammond Mfr. Series BPE2G.

#### **1.15 COORDINATION - DISCONNECTS STARTERS AND VFD DRIVES.**

- A. Disconnect starters and VFD drives shall be provided as indicated on the contract documents.
- B. Where a disconnect, starter and or a VFD drive is indicated in multiple contractors for the same piece of electrical equipment; both contractors shall include the items within their contracts. A single manufacturer disconnect, starter or VFD drive may not meet the requirement for the National Electrical Code or the requirements of the project.
- C. Where a disconnect, starter and or a VFD drive is indicated as provided with the piece of equipment it serves, the power wiring between the VFD drive and the component is to be provided by the contractor supplying the piece of equipment. The power wiring shall be in the same size and type serving the disconnect, starter and or a VFD drive. The power wiring shall be in similar assembly of conduit and wire type as indicated in Division 26 and serving the disconnect starter and or VFD drive.
- D. Where a disconnect, starter and or a VFD drive is indicated as provided as factory wired and provided for a piece of equipment, if the disconnect, starter and or a VFD drive is provided as a "loose" shipment or not installed on the equipment, the contractor supplying the piece of equipment shall be responsible to mount the disconnect, starter and or VFD drive. The power wiring between the disconnect, starter and or a VFD drive and the component is to be provided by the contractor supplying the piece of equipment. The power wiring shall be in the same size and type serving the disconnect starter and or a VFD drive. The power wiring shall be in similar assembly of conduit and wire type as indicated in division

- 26 and serving the disconnect starter and or VFD drive.
- E. Where a disconnect, starter and or a VFD drive is indicated to be provided as factory supplied and wired, the equipment manufacturer is responsible to size and install the wiring between the disconnect, starter and or VFD drive and the equipment which it serves. There shall be a single point power connection for the incoming service to the piece of equipment. If there are multiple power connections, the equipment supplying contractor shall be responsible to complete the wiring between the multiple power connections. The power wiring shall be in the same size and type serving the disconnect starter and or a VFD drive. The power wiring shall be in similar assembly of conduit and wire type as indicated in division 26 and serving the disconnect starter and or VFD drive.
  - F. Disconnects shall be suitable for use as an OSHA lockout/tagout disconnect when applied in accordance with part IV, Department of Labor OSHA 29 CFR part 1910.
  - G. Disconnect handles can be padlocked in the "off" position with up to three padlocks. Switch mechanism can be directly padlocked in the "off" position when the door is open.

#### **1.16 COORDINATION - EXISTING CONSTRUCTION**

- A. Cut all openings required in existing construction for installation of equipment and material. Perform all cutting, patching, and refinishing as required to match surroundings, whether or not specifically noted on Drawings.
- B. Existing Ceilings: Remove existing ceiling tile where required for installation of mechanical Work. Replace ceiling tiles as Work is completed. All damaged or broken ceiling tile caused by Contractor's workers shall be replaced by Contractor at no cost to Owner.

#### **1.17 EXISTING SYSTEM**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  - 1. Measure equipment voltage and amperage. Compare the values to motor nameplate information.
  - 2. Check for leaks.
  - 3. Check the operation of the drain pans.
  - 4. Check bearings and other lubricated parts for proper lubrication.
  - 5. Check that the controls are fully functioning.
  - 6. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

#### **1.18 COORDINATION - ROOFING**

- A. Contact roof bonding agent prior to disturbing any portion of existing roof. Coordinate and perform all roof work, including cutting, patching, base and counter-flashing, in accordance with roof bonding agent's recommendations. Certify all roof work where required by bonding agent and provide certificate of compliance Owner.
- B. Plumbing Contractor shall furnish roof drain and overflow drain assembly as indicated in Division 22.
- C. General Contractor shall install roof mounted assemblies including, roof rails, roof curbs, piping boots, and roof drains. Installation shall include but not be limited to cutting roof opening, re-enforcing opening, mounting curb, providing flashing and counter flashing all roof penetrations.
- D. General Contractor shall provide cover over opening until final equipment / cover is installed.

#### **1.19 COORDINATION - FIRE PROTECTION AND FIRE ALARM**



## A. Flow Switches:

1. Fire Protection Contractor will furnish and install flow switches on all risers.
2. Electrical Contractor shall wire and connection flow switches to the fire alarm system.
3. There shall be flow switches at each wet pipe riser assembly.
4. There shall be flow switches at each dry or preaction pipe riser assembly.
5. There shall be flow switches at each standpipe pipe riser assembly.

## B. Tamper Switches:

1. Fire Protection Contractor will furnish and install tamper switches on all valves.
2. Electrical Contractor shall wire and connection tamper switches to the fire alarm system.
3. There shall be a maximum of 3 tamper switches located with at the backflow preventer.
4. There shall be a maximum of 1 tamper switch located at the post indicator valve.
5. There shall be a maximum of 1 tamper switch located at each wet pipe riser assembly.
6. There shall be 2 tamper switches located at each dry pipe or preaction risers assembly.
7. There shall be a tamper switch located at each standpipe riser connection.

**1.20 EXCAVATION AND BACKFILL**

- A. Perform excavation and backfill required for Work under Division 21 and 22, inside and up to 5 feet outside building. Excavation and backfill shall be in accordance with requirements set forth in Division 31.
- B. Work shall include saw cutting, trenching, backfilling, patching, repairing and reseeding of all areas disturbed by excavation.
- C. Banks and excavations shall be retained by means of shoring and braces to avoid cave-ins. Shoring shall be in accordance with state and local regulatory agencies' requirements. Shoring shall be maintained until installation, tests and inspections are complete.
- D. Pumping equipment shall be provided and maintained to pump water from excavations.
- E. Comply with applicable regulations regarding identification and location of existing underground utility lines prior to excavation.

**1.21 PAINTING**

- A. Furnished equipment that is pre-painted or pre-finished by manufacturer shall have all nicks, scratches, blemishes, and rust spots cleaned, primed, and refinished prior to final acceptance by Owner.
- B. Painting shall be in accordance with the section 09 90 00 - Painting and Coating.

**1.22 COORDINATION DRAWINGS**

- A. Refer to section 01 00 00 - General Requirements.
  - B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
    1. Products installed in spaces, indicating coordination with general construction, building components, structural elements, architectural features and other building services. Include the following:
      - a. Piping greater than 1 inch.
      - b. Electrical conduit greater than 2 inches.
      - c. Structural bracing and supports.
      - d. Equipment.
      - e. Fixtures.
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2. Ceiling components.
  3. Structural members.
    - a. Foundations.
    - b. Footings.
    - c. Piers.
  4. Size and location of access panels.
  5. Penetrations of smoke barriers and fire-rated construction.
  6. Items penetrating finished ceiling including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Grilles, registers and diffusers.
    - e. Access panels.
    - f. Perimeter moldings.
    - g. Fire Sprinklers.
  - C. Show timing or phasing, if any, and how the work will be coordinated with other work.
  - D. Show clearance for installing, servicing and maintaining equipment.
  - E. Include copies of all cross-referenced drawings and documents.
  - F. Prepare drawings specifically for this project; marked up or over-drawn plumbing, electrical, HVAC, or other drawings are not acceptable, except for floor plans.
  - G. Use drawing scale of 1/4 inch to 1 foot or larger.
  - H. Include a complete equipment list, identifying manufacturer's model numbers and quantities, cross-referenced to product data submittal.
  - I. Include wiring diagrams for control panels and all electrical equipment, showing terminations and termination identifications.
  - J. Drawings shall be submitted in both PDF format and paper copy on sheet size that matches the construction bid documents. Drawings shall be submitted as both a submittal for the engineer to review and a final copy given to the owner with the PDF files burned onto a CD or hard drive / USB accessible memory stick. Hard drive / USB accessible memory stick and CD provided by Contractor.

#### **1.23 FIELD CONDITIONS**

- A. Refer to Section 01 51 00 - Temporary Utilities.
- B. Maintain ambient temperatures and conditions required by manufacturers of products for the installation of materials. Including but not limited to the following: adhesives, mastics, cements, paints and plastics.
- C. Maintain ambient temperatures and conditions required by the system until the permanent means of protection is active. Including but not limited to the following: freeze protection of water or fluid filled coils, piping or equipment.
- D. Do not excavate or backfill when ground is saturated or frozen.

#### **1.24 PERMIT AND FEES**

- A. Refer to Section 01 00 00 - General Requirements.
- B. Secure all permits and inspections required by applicable authorities and utilities and pay all costs in connection with the Work.

- C. Schedule all inspections required by applicable authorities and utilities. Certificates shall be in triplicate and shall be delivered to Owner.
- D. Piping work, specialties, or equipment shall not be concealed or covered until same have been tested and inspected by municipal inspector(s) and observed by the professional. Municipal inspector(s) record of inspections shall be delivered to Owner. The professional and municipal inspector's witnessing of tests shall not relieve Contractor of his responsibility for concealed piping work and specialties, nor for equipment to perform in accordance with Contract Documents.

#### **1.25 FAULTY WORK**

- A. Refer to Section 01 00 00 - General Requirements.
- B. If Architect is required to make extensive visits to the site to investigate defective or incomplete Work by Contractor, a Change Order will be issued to the Contractor for a credit due on the Contract Price to recoup expenses. Defective Work, as used here, refers to Work that is unsatisfactory, faulty, or deficient, or does not conform to Contract Documents, or does not meet requirements of any inspection, test, or approval referred to in Contract Documents, or has been damaged prior to Architect's recommendation of final payment. An appropriate and reasonable charge will be allowed for Engineer's direct and indirect expenses, in accordance with his normal rates, for Architect's assistance in correcting defective Work.
- C. If Architect is requested or required, for any reason, to visit the site and make extensive or exhaustive inspections and if Work is found to be defective (as defined above), an appropriate and reasonable charge will be made by Mechanical Engineer to Owner. Contractor is liable for these charges under his continuing obligation (as described above).
- D. If Work is found to be not defective Contractor will not be liable for Architect's charges.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- A. Refer to Section 01 00 00 - General Requirements.
- B. All materials and equipment shall be new, without imperfections or blemishes, and shall be protected from the elements prior to installation.
- C. Maintain ambient temperatures and conditions required by manufacturers of products for the installation of materials. Including but limited to the following: Adhesives, mastics, cements, paints and plastics.

#### **2.2 ACCESS DOORS**

- A. Refer to specification 08 31 00 - Access Doors and Panels.

#### **2.3 FIRE SEALANT**

- A. Refer to specification 07 84 00 - Firestopping.

#### **2.4 JOINT SEALANT**

- A. Refer to specification 07 90 05 - Joint Sealers.

#### **2.5 CONCRETE**

- A. Refer to Division 03.

#### **2.6 PIPE PORTALS**

- A. Construction: 18 gage galvanized steel, unitized construction with integral base plate.
- B. Standard Features:
  - 1. 12" tall above finished roof surface.
  - 2. Built in raised cant.
  - 3. Wood nailer.
  - 4. 3 lb. density insulation.
  - 5. Acrylic clad ABS plastic cover, fastening screws, graduated step boots with stainless steel clamps.

## **2.7 VENT FLASHING**

- A. Flash vent penetrating roofs with 6 lb. seamless sheet lead of sufficient size to extend a minimum of 10 inches into roofing felts and for membrane roofing systems.

## **2.8 ANCHORS**

- A. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
- B. Washers: ASTM F 844, steel, plain, flat washers.
- C. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - 1. Stainless-steel studs are available.
  - 2. Stud: Threaded, zinc-coated carbon steel.
  - 3. Expansion Plug: Zinc-coated steel.
  - 4. Washer and Nut: Zinc-coated steel.
- D. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - 1. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
  - 2. Stainless-steel studs are available.
  - 3. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
  - 4. Washer and Nut: Zinc-coated steel.

## **2.9 STEEL**

- A. Steel Shapes and Plates: ASTM A 36/A 36M.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install work according to the following:
  - 1. Federal, State and Local codes.
  - 2. Manufacturer's recommendations.
- B. Work shall be installed by mechanics skilled in the trade involved.
- C. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

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5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- D. Coordinated Installation:
1. All equipment and materials shall be installed to allow access to and to facilitate service, maintenance, repair, replacement, etc., of components to all equipment furnished and installed under this Contract, furnished and installed under all other Divisions of the specifications, and, where applicable, Owner furnished and installed and Owner's existing equipment.
  2. Piping, equipment, etc., shall be installed in such a manner as to preserve access to equipment.
  3. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
  4. Install piping to conserve building space, to not interfere with use of space and other work.
  5. Group piping whenever practical at common elevations.
  6. Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Install per UL listing.
- F. Fire Stop Sealing System:
1. All floor and interior wall penetrations with smoke or fire rating of one hour or more shall be sealed.
  2. Refer to architectural drawings for locations of fire rated floors and walls.
  3. Refer to existing building wall construction and match existing penetrations, if both rated and non-rated penetrations existing in an existing wall. Rated penetrations shall be provided.
  4. Through penetration fire stop sealing systems shall be identified on both sides with permanently mounted, preprinted vinyl labels which include the following information:
    - a. The words "Warning: Through Penetration Firestop System - Do Not Disturb" or similar phrase.
    - b. Manufacturer's brand name, product type or catalog number.
    - c. Testing agency designation and rating.
    - d. Installer's Name.
    - e. Installation Date.
- G. Pipe Portals:
1. Pipe portals provided as Work of this Section shall be coordinated with roof type. Shop drawing submittals for pipe portals, with, or without cants will be considered compatible with existing roof type.
  2. Pipe portals provided as Work of this Section shall be coordinated with requirements of roofing subcontractor. Shop drawing submittals for pipe portals, with or without cants will be considered in compliance with roofer's requirements.
- H. Access Panels:
1. Furnish and install access panels in ceilings and walls for service and repair access to concealed equipment, including, but not limited to:
    - a. Valves: Hand operated and automatic.
    - b. Gages and thermometers.
    - c. Water hammer arresters.
    - d. Pressure regulating/reducing valves.
    - e. Expansion compensators.
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- f. Calibrated balancing valves.
  - 2. Minimum Size: 18 inches by 18 inches. Where restrictions will not permit minimum size, verify access panel size with Architect.
  - 3. Provide access panels type in accordance with section 08 31 00 - Access Doors and Panels.
  - I. Concrete and Grout:
    - 1. Construct concrete equipment bases of dimensions indicated, but not less than 6 inches larger than supported unit in both directions and minimum of 6 inches in thickness unless otherwise indicated. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.
    - 2. Place grout on concrete bases to provide a smooth bearing surface for equipment.
    - 3. Place grout around anchors.
    - 4. Cure placed grout according to manufacturer's printed instructions.
  - J. Erection of Metal Supports and Anchorage:
    - 1. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
    - 2. Field Welding: Comply with AWS D1.1 - Structural Welding Code--Steel.
    - 3. Comply with the requirements specified in Division 05.
  - K. Utility Services:
    - 1. Fire Protection Service:
      - a. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at water-service entrance.
      - b. Rough-in piping for meter installation according to utility company's requirements.
    - 2. Water Service:
      - a. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each water-service entrance.
      - b. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

### **3.2 CLEAN-UP**

- A. Upon completion of Work, remove all dirt, foreign materials, markings, stains, fingerprints, etc., from all parts and equipment.
- B. Remove all construction debris and vacuum interior spaces of all compartmental equipment.
- C. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations and anti-pollution laws.
- D. Work shall be subject to inspection by the Architect.

### **3.3 SYSTEM FLUSHING AND TESTING**

- A. Domestic Water system shall be flushed with water and tested to 125 PSI.
  - 1. Clean and disinfect potable domestic water piping as follows:
    - a. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
    - b. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

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- 1) Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - 2) Fill and isolate system according to either of the following:
    - (a) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - (b) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
  - 3) Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - 4) Repeat procedures if biological examination shows contamination.
  - 5) Submit water samples in sterile bottles to authorities having jurisdiction.
2. Clean non-potable domestic water piping as follows:
    - a. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
    - b. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
      - 1) Flush piping system with clean, potable water until dirty water does not appear at outlets.
      - 2) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
  3. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
  4. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.
- B. Sanitary Sewer:
1. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
    - a. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
    - b. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    - c. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
    - d. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gas tight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
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- e. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - f. Prepare reports for tests and required corrective action.
- C. Storm Drainage:
- 1. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
    - a. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
    - b. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    - c. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
    - d. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gas tight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
    - e. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
    - f. Prepare reports for tests and required corrective action.

### **3.4 DUST AND DEBRIS**

- A. During construction all openings in piping shall be kept closed except when actual work is being performed on those items. Closures shall be plugs, caps, blind flanges, or other items specifically intended for this purpose. Exercise all necessary care to prevent foreign objects from entering material.
- B. During construction all equipment shall be kept closed except when actual work is being performed on those items. Closures shall be plugs, caps, blind flanges, or other items specifically intended for this purpose. Exercise all necessary care to prevent foreign objects from entering material.
- C. During patching above ceiling, etc., maintain cloths or suitable covers to protect surfaces. Protective measures (drop cloths, protective covers, etc.) shall be placed and sealed over all furniture and equipment to keep items clean and protected against dirt, dust, and debris from entering furniture and equipment that the Owner has not removed.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

### **3.5 START-UP**

- A. Submit proposed start-up checklist and proposed start-up dates for Owner and Architect review 14 days prior to start-up.



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1. Start-up shall be included for all equipment that is scheduled and has either an electrical connection or fuel connection.
  - B. Start-up shall be provided for all equipment and systems.
    1. Start-up for equipment shall be performed by:
      - a. Installing Contractor:
        - 1) For equipment with 120 volt and less than 20 amp load electrical connection or less than 100 MBH fuel connection.
      - b. Factory Authorized Personnel:
        - 1) For equipment with 120 volt electrical connections or less than 400 MBH fuel connection.
      - c. Factory Field Personnel:
        - 1) For equipment greater than 120 volt electrical connection or greater than 400 MBH fuel connection.
    2. Start-up for systems shall be performed by:
      - a. Installing Contractor:
        - 1) For all systems not listed under 1.b and 1.c above.
      - b. Factory Authorized Personnel:
        - 1) Regulator manufacturer shall start-up all gas systems above 7 psi.
  - C. Report:
    1. Submit report to Owner within 10 days of completion of start-up.
    2. Report shall include:
      - a. Location / System / Equipment Tag.
      - b. Names of Technicians performing Start-up.
      - c. Indicate if Technicians are factory Authorized Personnel or Factory Field Personnel.
      - d. Names of Witnesses.
      - e. Start-up Checklist / Information in each start-up section.
      - f. List of all set points and initial settings.
      - g. Pressure test results.

### **3.6 TRAINING**

- A. Owner-Personnel Training: Owner will designate personnel to be trained in operation and maintenance of the systems.
    1. Obtain Owner's approval of training dates.
    2. Training sessions will be scheduled by Owner.
    3. Submit proposed training agenda for Owner's review and approval at least 30 days prior to start of training.
  - B. Training Agenda: Include the following:
    1. Overview of system operation.
    2. Overview of system equipment and device locations.
    3. Manual controls.
    4. Manual operation, testing and maintenance of devices.
    5. Location of safety devices and resets.
    6. User operation of control panel (alarm acknowledgement, alarm silence, reset, alarm resound).
    7. Draining and filling procedures for the system.
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8. Review of the Operation and Maintenance Manual.
  9. Detailed maintenance procedures.
  10. Periodic testing procedures.
- C. Training Instructor:
1. The following persons are authorized to provide training:
    - a. Installing Contractor.
    - b. Factory Authorized Technician.
    - c. Factory Start-Up and Training Personnel.
- D. Video Recordings:
1. Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  2. At beginning of each training module, record each chart containing learning objective and lesson outline.
  3. Provide high quality color video recordings with menu navigation in format acceptable to Architect.
  4. Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
  5. Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
  6. Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
  7. Provide video recordings used as a component of training modules in same format as recordings of live training.

### **3.7 EXTENDED WARRANTIES**

- A. Where extended warranties beyond the normal one year warranty are, as specified herein, to be applied to a particular item of equipment or system, furnish to Owner a description of the warranty along with any required registration and signature of manufacturer's authorized personnel.
- B. Contractor shall be responsible for coordinating with and having the manufacturer administer these warranties for the full extent of time the warranty will be in effect.
- C. Contractor shall be responsible for administering and servicing all extended warranties for the life of each extended warranty at no additional cost to Owner. Owner's responsibility will be for additional costs for parts associated with warranties that are warranted on a pro-rated basis. All labor for administering and servicing the extended warranty, including actual replacement of parts, will be the responsibility of the Contractor for the extended warranty period. All unwarranted shipping and handling costs for parts and equipment will be the responsibility of the Owner.

**END OF SECTION 22 00 00**