

## SECTION 22 0000 - COMMON WORK RESULTS FOR PLUMBING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. General Plumbing Requirements specifically applicable to all Division 22 Sections.
  - 2. Some piping material and installation instructions common to most piping systems.
  - 3. Grout.
  - 4. Plumbing Demolition (when indicated on the drawings).
  - 5. Equipment installation requirements common to equipment sections.
  - 6. Concrete bases.
  - 7. Supports and anchorages.
- B. Related Requirements:
  - 1. Section 013513 "Special Project Procedures" for Owner requirements
  - 2. Section 017700 "CloseOut Procedures"
  - 3. Section 017823 "Operation and Maintenance Data"
  - 4. Section 017839 "Project Record Documentation"
  - 5. Section 017900 "Demonstration and Training"

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, 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 chases.
- 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 rubber materials:

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

#### 1.4 REFERENCES AND STANDARDS:

A. The editions recognized by latest **[City of Chicago Codes and Standards] [City of Evanston Codes and Standards]** of the following are hereby included in and made a part of Division 22:

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|-----|-------|--|
| 1.  | NFPA  | National Fire Protection Association           |
| 2.  | UL    | Underwriters' Laboratories, Inc.               |
| 3.  | NEMA  | National Electrical Manufacturer's Association |
| 4.  | NEC   | National Electric Code                         |
| 5.  | ASME  | American Society of Mechanical Engineers       |
| 6.  | AWS   | American Welding Society                       |
| 7.  | ANSI  | American National Standards Institute          |
| 8.  | AGA   | American Gas Association                       |
| 9.  | HI    | Hydronics Institute                            |
| 10. | OSHA  | Occupational Safety and Health Act             |
| 11. | AWWA  | American Water Works Association               |
| 12. | CISPI | Cast Iron Soil Pipe Institute                  |

#### 1.5 QUALITY ASSURANCE AND COORDINATION

- A. Electrical Characteristics for 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.
- B. All work to meet in-force local plumbing code. In the case of discrepancies between the project contract documents and the in-force local code, the most stringent shall govern.
- C. As NU FMO plumbing staff shall walk through and inspect all plumbing work prior to walls or ceilings being closed up, deficiencies shall be noted and given to the project manager in writing.
- D. Comply with most current edition of Northwestern University Design Standards.
- E. All materials and installations shall meet applicable FM Global requirements.

#### 1.6 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.

#### 1.7 COORDINATION

- A. Contractor shall coordinate the work of the different trades so that interference between piping, equipment, structural, and electrical work will be avoided. All necessary offsets in piping and

ductwork, and all fittings, and other components, required to install the work properly shall be furnished complete in place at no additional cost.

B. Unless otherwise stipulated under a particular heading, the following rules relative to responsibilities of the Contractors and Subcontractors will apply:

1. Make-up water piping connections shall be provided by the Plumbing Contractor to within five (5) feet of the required point of connection to the equipment and there terminated with a shut-off valve. Each trade shall make the final connection to the equipment it installs.
2. Ceiling access panels will be installed by the General Contractor at locations determined by the Plumbing Contractor.
3. The Plumbing Contractor or subcontractor shall install all roughing-in pertaining to his trade for each item of equipment furnished under another Section of the Specifications or by the Owner.
4. The Plumbing Contractor shall make final connections of equipment to rough-ins.

#### 1.8 EQUIPMENT START-UP

A. Start-up of all plumbing equipment shall be video-recorded by the plumbing contractor. Two DVD copies or a media file shall be turned over to the Owner's maintenance staff.

#### 1.9 TESTING AND REPAIR

A. All piping and ductwork systems shall be thoroughly cleaned and flushed prior to final testing.

B. Pressure testing shall be completed for the following piping systems:

1. Domestic water, sanitary and vent, storm and gas piping systems, and other systems as noted on the plans.

C. All testing must be witnessed and accurately recorded by FMO personnel noting methods of testing, times, dates, and results.

D. Any damage as a result of tests shall be repaired or damaged materials replaced at no cost to the Owner.

#### 1.10 FINAL COMPLETION

A. All work shall be cleaned prior to issuance of Substantial Completion.

B. Retouch or repaint factory painted prime and finish coats where scratched or damaged.

C. Deliver any equipment as required by this Specification to Owner and obtained signed receipts of delivery.

D. Clean equipment, restore damaged materials, and leave the Work in acceptable condition.

E. Remove all site tools, equipment, surplus materials and rubbish continuously at no additional cost to the Owner.

F. Contractor shall submit written certificates warranting each item of equipment.

- G. Attic stock of at least 5 % or 1 of every fixture should be stored on site or turned over to FMO personnel after completion of the project.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT AND MATERIALS:

- A. All equipment and materials shall be furnished in strict accordance with the equipment named and according to Specification requirements. Each bid shall be based upon one of the materials or manufacturers specified.
- B. Equipment and materials specified shall be considered to have prior approval, but submittal for approval is required. Furnish construction drawings to other Contractors when required to coordinate construction.
- C. Where multiple manufacturers are named the drawings and specifications are based on the requirements and layouts for the equipment of the first named manufacturer. Any change required by the use of other named manufacturers such as revisions to foundations, bases, piping, controls, wiring, openings, and appurtenances shall be made by the Contractor at no additional cost to the Owner.

### 2.2 PIPE, TUBE, AND FITTINGS - GENERAL

- A. Refer to individual Division 22 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 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PLUMBING DEMOLITION (When indicated on the drawings)

- A. Refer to applicable Division 01 Section covering cutting and patching and applicable Division 02 Section covering selective structure demolition for general demolition requirements and procedures.
- B. 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.

- C. All unused waste, water and vent that is no longer in service shall be removed from ceilings, walls and floors. No dead piping will be allowed to stay. Underground piping shall also be removed. If piping cannot be removed underground it shall be capped at the main and the pipe shall be pumped and filled with a flowable fill.
- D. A MOP will be required when filling abandoned sewers, old water mains or any plumbing piping that is buried in the ground.
- E. Before abandoning any plumbing piping underground, the piping shall be inspected, video recorded, mapped on an as built and FMDC and FMO shall approve abandoning the piping.
- F. After completion of all work, all of the sewer systems involved with the project in their entirety, shall be thoroughly cleaned out to remove all grit, or other foreign matter. This shall include the use of a camera and recording to a flash drive or DVD and a copy of the recording included with the close out documents.

### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. All materials and/or equipment shall be installed per manufacturer's recommendations and instructions.
- B. When temporary water is required, an approved backflow device shall be used and testing reports from device shall be sent to FMO plumbing foreman for verification.
- C. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- D. 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.
- E. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Piping shall not project beyond walls or steel lines nor shall it hang below slabs more than is absolutely necessary. Particular attention shall be paid to the required clearances.
- H. Offset piping where required to avoid interference with other work, to provide greater headroom or clearance, or to conceal pipe more readily. Offsets shall be properly drained or trapped where necessary. Trapped water should be avoided. Any piping that must be installed trapping water shall be equipped with a drain down at all low points.
- I. Provide swing joints and expansion bends wherever required to allow the piping to expand without undue stress to connections or equipment.
- J. Exposed piping around fixtures or in other conspicuous places shall not show tool marks at fittings.

- K. Isolate pipe from the building construction to prevent transmission of vibration to the structure and to eliminate noise.
- L. Install piping such that any equipment connected to piping may be removed by disconnecting two (2) flanges or unions and removing only one or two pipe sections. All equipment shall have bolted or screwed flanges or unions at pipe connections.
- M. Install fittings for changes in direction and branch connections. T-drill system for mechanically formed tee connections and couplings, and Victaulic hole cut piping system are not allowed.
- N. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment. This includes the rooms and spaces located in the floors below. If this is not possible, a floor drain and a water proof epoxy coated floor must be installed and tested with a minimum of 1" standing water.
- O. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- P. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- Q. Install piping to permit valve servicing.
- R. Install piping at indicated slopes.
- S. Install piping free of sags and bends.
- T. Install piping to allow application of insulation.
- U. Eccentric reducing couplings shall be provided in all cases where air or water pockets would otherwise occur due to a reduction in pipe size.
- V. Cap and plug all openings in pipes during construction with suitable metal plugs or cap to keep out dirt and rubbish until equipment is connected.
- W. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- X. Select system components with pressure rating equal to or greater than system operating pressure.
- Y. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- Z. Verify final equipment locations for roughing-in.
- AA. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- BB. Provide proper access to materials and equipment that require inspection, repair, service, or maintenance.

- CC. Minimum service access size for materials equipment/components above ceilings shall be 24" square.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 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. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

### 3.4 PIPING CONNECTIONS

- A. Pipe sizes indicated shall be carried full size to equipment served. Any change of size to match equipment connection shall be made within one foot of the equipment. At temperature control valves with sizes smaller than connected lines, reduction shall be made immediately adjacent to valves.

### 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 Plumbing 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 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. Install dowel rods to connect concrete base to concrete floor.
  2. 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 03 Section "Cast-in-Place Concrete"

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor Plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

- A. Mix and install grout for Plumbing 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.

**END OF SECTION 22 0000**