

## **SECTION 220800**

### **CLEANING AND TESTING**

#### **PART 1 GENERAL**

##### **1.01 SUBMITTALS**

- A. Quality Control Submittals
  - 1. Test Reports (Field Tests): Submit data for each system tested, and/or disinfected; include date performed, description, and test results for each system.

##### **1.02 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.
  - 2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

##### **1.03 PROJECT CONDITIONS**

- A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gages for field testing of systems.

##### **1.04 SEQUENCING AND SCHEDULING**

- A. Transmit written notification of proposed date and time of operational tests to the Director's Representative at least 5 days in advance of such tests.
- B. Perform cleaning and testing Work in the presence of the Director's Representative.
- C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems, or temporary valves or caps as required to perform the Work.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Test Equipment and Instruments: Type and kind as required for the particular system under test.

- B. Test Media (air, vacuum, water): As specified for the particular piping or system under test.
- C. Cleaning Agent (water): As specified for the particular piping, apparatus or system being cleaned.

## **PART 3 EXECUTION**

### **3.01 PRELIMINARY WORK**

- A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

### **3.02 PRESSURE TESTS - PIPING**

- A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.
- B. Drainage, Vent, Conductor and Roof Drain Piping (Inside Buildings): Perform tests before fixtures are installed. Test by filling the entire system with water, and allowing to stand for 3 hours, with no noticeable loss of water. Test joints under a minimum head of 10 feet of water, except the uppermost section. Test the uppermost section to overflowing.

**END OF SECTION**

**SECTION 221100**  
**PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 RELATED WORK SPECIFIED ELSEWHERE**

- A. Through Penetration Firestops: Section 078400.
- B. Sealants: Section 079200.

**1.02 SUBMITTALS**

- A. Product Data:
  - 1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
  - 2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.
- B. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel within this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.
  - 1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services*.

**1.03 QUALITY ASSURANCE**

- A. Qualification of Brazers: Comply with the following:
  - 1. The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.

**PART 2 PRODUCTS**

**2.01 STEEL PIPE AND FITTINGS**

- A. Steel Pipe for Threading: Standard weight, Schedule 40, black or galvanized; ASTM A 53 or ASTM A 135.
- B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black or galvanized; ASTM A 53, Grade B, Type F for sizes 3/4 inch to 1-1/2 inch, and Type E or S for sizes 2 inch to 24 inch, or ASTM A 135.
- C. Cast Iron Fittings:
  - 1. Drainage Pattern, Threaded: ASME B16.12.

- 2. Steam Pattern, Threaded: ASME B16.4.
  - a. Standard Weight: Class 125.
  - b. Extra Heavy Weight: Class 250.
- 3. Flanged Fittings and Threaded Flanges: ASME B16.1.
  - a. Standard Weight: Class 125.
  - b. Extra Heavy: Class 250.
- D. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.
- E. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- F. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

## **2.02 CAST IRON PIPE AND FITTINGS**

- A. Bell and Spigot Soil Pipe: Service Weight, Bitumin coated; ASTM A 74.
- B. Bell and Spigot Soil Pipe Fittings: Service Weight, Bitumin coated; ASTM A 74.
- C. Hubless Pipe: Bitumin coated; Cast Iron Soil Pipe Institute Standard No. 301.
- D. Hubless Pipe Fittings: Drainage Pattern, Bitumin coated; Cast Iron Soil Pipe Institute Standard No. 301.
- E. Hubless Joint Couplings: Stainless steel shield and clamp assembly, and elastomer sealing sleeve; CISPI-310.
- F. Water Pipe Fittings: Bitumin coated, cement-mortar lined; AWWA C110.

## **2.03 DUCTILE IRON PIPE AND FITTINGS**

- A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.
  - 1. 3 and 4 Inch Sizes: Class 51.
  - 2. 6 inch Size and Over: Class 50.
- B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

## **2.04 COUPLINGS AND FITTINGS FOR GROOVED END PIPE**

- A. Couplings: Grinnell Corp.'s Rigidlok Fig. 7401, or Victaulic Co.'s Style 107, having minimum pressure rating of:
  - 1. 750 psi from 1-1/2 inch to 4 inch.
  - 2. 700 psi for 6 inch.
  - 3. 600 psi for 8 inch.
- B. Couplings: Gustin-Bacon Inc.'s No. 100 Gruvagrips, or Victaulic Co.'s Style 77, having pressure rating of:

1. 1000 psi for 3/4 inch to 6 inch.
  2. 800 psi for 8 inch to 12 inch.
  3. 300 psi for 14 inch to 24 inch.
- C. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:
1. Steel: ASTM A 53 or A 106, Grade B.
  2. Malleable Iron: ASTM A 47.
  3. Ductile Iron: ASTM A 536.

## **2.05 JOINING AND SEALANT MATERIALS**

- A. Thread Sealant:
1. LA-CO Industries', Slic-Tite Paste with Teflon.
  2. Loctite Corp.'s No. 565 Thread Sealant.
  3. Thread sealants for potable water shall be NSF approved.
- B. Thread Sealant (Natural Gas Piping): Rectorseal Corp.'s T Plus 2 non-hardening pipe dope with teflon.
- C. Solder: Solid wire type conforming to the following:
1. Type 3: Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB); Engelhard Corp.'s Silvacrite 100, Federated Fry Metals' Aqua Clean, or J.W. Harris Co. Inc.'s Stay-Safe Bridgit.
- D. Soldering Flux for Soldered Joints: All-State Welding Products Inc.'s Duzall, Engelhard Corp.'s General Purpose Liquid or Paste, Federated Fry Metals' Water Flow 2000, or J.W. Harris Co. Inc.'s Stay-Clean.
- E. Joint Packing:
1. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504) 466-1484.
  2. Acid Resistant Joint Packing: Sealite Inc.'s Red Stripe, Asbestos-Free Acid-Resistant White Oakum, No. 312.
- F. Gaskets For Use With Ductile Iron Water Pipe and Cast Iron Drainage Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.
- G. Flange Gasket Material:
1. For Use with Cold Water: 1/16 inch thick rubber.
  2. For Use with Hot Water, Air or Steam: Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.
- H. Gaskets For Use With Grooved End Pipes and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

- I. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.

## **2.06 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS**

- A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504)466-1484.
- B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

## **2.07 PIPE SLEEVES**

- A. Type A: Schedule 40 steel pipe.
- B. Type B: No. 16 gage galvanized sheet steel.
- C. Type C: Schedule 40 steel pipe with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.
- D. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

## **2.08 FLOOR, WALL AND CEILING PLATES**

- A. Cast Iron or Malleable Iron: Solid type, galvanized finish, with set screw:
  - 1. Model 395 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
  - 2. Model 900-016XX by Landsdale International, Westville, NJ 08093, (800) 908-0523.

# **PART 3 EXECUTION**

## **3.01 INSTALLATION**

- A. Install piping at approximate locations indicated, and at maximum height.
- B. Install piping clear of door swings, and above sash heads.
- C. Make allowances for expansion and contraction.
- D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.
- E. Install horizontal piping with a constant pitch, and without sags or humps.
  - 1. Water Piping: Pitch 1/4 inch per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch,

- establish a new low point and continue. At the low point, provide a 1/2 inch drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.
2. Drainage Piping: Pitch 1/4 inch per foot downward, in direction of flow, unless otherwise noted.
  3. Vent Piping: Pitch 1/4 inch per foot upward, unless otherwise noted.
- F. Install vertical piping plumb.
- G. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube.
- H. Cut pipe and tubing ends square; ream before joining.
- I. Threading: Use American Standard Taper Pipe Thread Dies.
1. Thread brass pipe with special brass threading dies.

### **3.02 DRAINAGE SYSTEMS**

- A. Fittings:
1. Use long turn drainage pattern fittings, unless space conditions prohibit their use; in such cases, short turn pattern fittings may be used.
  2. Vertical Offsets: Make vertical offsets with 45 degree elbows, or 1/8 bends.
  3. Tucker Fittings: Tucker fittings may only be installed in vertical piping.
- B. Cleanouts:
1. Install cleanouts with sufficient side and end clearance to allow for the removal of the cleanout plug, and the use of cleaning tools.
  2. Lubricate cleanout plugs with anti-seize lubricant.

### **3.03 PIPE JOINT MAKE-UP**

- A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.
- B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.
- C. Flanged Pipe Joint:
1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
  2. Provide a gasket for each joint.
    - a.
    - b.
  3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

- D. Calked Joint: Pack hub with joint packing specified, and calk. Run 12 ounces molten lead for each inch of pipe diameter. Calk cooled lead ring and face off smoothly.
- E. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.
- F. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
  - 1. Cut grooved end piping is not acceptable.
- G. Hubless CI Pipe Joint: Make up joint with hubless fitting and couplings, in conformance with the manufacturer's printed installation instructions.
- H. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.
- I. Dissimilar Pipe Joint:
  - 1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and calk into the cast iron bell.
  - 2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
  - 3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
  - 4. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.
  - 5. Joining FRP and Threaded Pipe: Make up connection with adapters as recommended by manufacturers of piping being joined.

### 3.04 PIPING PENETRATIONS

- A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

|     | CONSTRUCTION          | SLEEVE TYPE   |
|-----|-----------------------|---------------|
| 1.  | Frame construction.   | None Required |
| 2.  | Foundation walls.     | A*            |
| 14. | Non-metal roof decks. | A             |
| 17. | Waterproof walls.     | A             |

\*Core drilling is permissible in lieu of sleeves where marked with asterisks.

- B. Diameter of Sleeves and Core Drilled Holes:
  - 1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.



2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
    - a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
    - b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.
    - c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.
  3. Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13.
- C. Length of Sleeves (except as shown otherwise on Drawings):
1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
  4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.
- D. Packing of Sleeves and Core Drilled Holes:
1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
  2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
    - a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.

### **3.05 FLOOR, WALL AND CEILING PLATES**

- A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
2. Unfinished Spaces (Including Exterior Concrete Slabs): Solid, unplated cast iron.
  3. Fasten plates with set screws.
  4. Plates are not required in pipe shafts or furred spaces.

### **3.06 PIPE AND FITTING SCHEDULE**

- A. Where options are given, choose only one option for each piping service. No deviations from the selected option will be allowed.
- B. Drainage (Storm) Above Ground:
1. Option No. 1: Standard weight galvanized steel pipe, with galvanized cast iron drainage pattern fittings, and threaded joints.

2. Option No. 2: Standard weight galvanized steel pipe, with roll grooved ends, grooved pipe fittings and couplings of coated ductile iron or hot dipped galvanized malleable iron.
3. Option No. 3: Service weight, coated, cast iron bell and spigot pipe and fittings, with calked joints.
4. Option No. 4: Service weight, coated, cast iron bell and spigot pipe and fittings, with rubber ring push-on joints.
5. Option No. 5: Hubless, coated, cast iron pipe, fittings and joint couplings.

**END OF SECTION**

## **SECTION 221426**

### **ROOF DRAINS**

#### **PART 1 GENERAL**

##### **1.01 PRODUCTS NOT PROVIDED UNDER THIS SECTION**

- A. Flashing and Trim: Construction Work Contract.
- B. Openings in Steel, Precast Concrete and Prestressed Concrete Deck Units: Construction Work Contract.

##### **1.02 REFERENCES**

- A. Unless otherwise specified, the Work of this Section shall meet the applicable requirements of ASME A112.21.2 - Roof Drains.

##### **1.03 SUBMITTALS**

- A. Product Data: Catalog sheets, specifications and installation instructions.
- B. Contract Closeout Submittals:
  - 1. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative.

##### **1.04 MAINTENANCE**

- A. Special Tools: Deliver to the Director's Representative.
  - 1. Tools for Vandal Resistant Fasteners: One for each type and size.

#### **PART 2 PRODUCTS**

##### **2.01 ROOF DRAINS**

- A. Drain Body: Coated cast iron, large size sump, minimum 15 inch dia, with integral bosses or lugs drilled and tapped for fastening flashing clamp and underdeck clamp, corrosion resistant bolts, bottom outlet, and connection to match piping option selected.
- B. Flashing Clamp: Coated cast iron, non-puncturing type compression ring with integral, notched gravel stop and dome locking receiver.
- C. Dome Strainer: Coated cast iron, low profile type, with narrow vertical slotted openings, bayonet locking flange, secured with stainless steel vandal resistant fasteners.
  - 1. Minimum Dome Strainer Opening Area:

| <b>CONNECTING PIPE SIZES<br/>(Inches Nominal)</b> | <b>DOMESTRAINER FREE AREA<br/>(Square inches)</b> |
|---------------------------------------------------|---------------------------------------------------|
| 2                                                 | 18                                                |
| 3                                                 | 25                                                |
| 4                                                 | 36                                                |
| 5                                                 | 50                                                |
| 6                                                 | 70                                                |

- D. Acceptable Drain Series: Josam 21500, Smith 1010, Wade W3000, and Zurn Z100.

## **2.02 FASTENERS**

- A. Corrosion Resistant Fasteners: Brass, bronze, or Type 302 or 304 stainless steel bolts acceptable.
- B. Vandal Resistant Fasteners: Torx head with center pin.
- C. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Broadview, IL; Molycote 1000 by Dow Corning Corp, Midland, MI; Anti-Seize Lubricant by Loctite Corp, Newington, CT.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install the Work of this Section in accordance with manufacturer's printed installation instructions, unless otherwise specified.
- B. Coordinate drain installation with deck and roofing Work.
- C. Unless otherwise indicated by dimensions on the Drawings, locate drains as follows:
1. Place drains minimum 3 feet away from items on roof (parapets, walls, gravelstops, pipes, vents, scuttles, equipment and curbs, etc.) to allow for flashing.
  2. Install drains at low points of roof deck and where normal deck deflection will be at its maximum.
- D. Drains in Cast Concrete: Set and securely brace drain body so that sump flange is level with, or slightly below surface of concrete.
- E. Fasteners:
1. Coat bolt threads with anti-seize lubricant before final installation.
  2. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

**END OF SECTION**