

## **SECTION 22 10 20**

### **PLUMBING PIPING AND ACCESSORIES**

#### **PART 1 - GENERAL**

##### 1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 23 01 00, "Mechanical General Provisions", govern this Section.

##### 1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide complete operating plumbing piping systems including pipe, tube, fittings, and appurtenances as indicated and in compliance with these Specifications
- B. Plumbing Services: Secure all plumbing services necessary for the project as required or shown on the Contract Drawings, including paying all required fees and charges. Work related to plumbing services maybe shown on Plumbing, Civil, Architectural or other drawings in the Contract Documents
- C. The Division 23 Contractor shall be responsible for coordinating plumbing services and site utility work as shown on the Contract Drawings with the General Contractor to determine what work is included in the scope of the Division 23 Contractor.

##### 1.3 QUALITY ASSURANCE:

- A. Welding: Qualify welding procedures, welders, and operators in accordance with ANSI B31.1, Paragraph 127.5, for shop and job site welding of piping work. Make welded joints on the piping system with continuous welds, without backing rings and with pipe ends beveled before welding. Gas cuts shall be true and free from burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no weld metal shall project inside the pipe. Refer to Section 15050 for additional requirements.

#### **PART 2 - PRODUCTS**

##### 2.1 PIPING MATERIALS:

- A. General: Provide pipe and tube of type, joint, grade, size, and weight (wall thickness, schedule or class) indicated for each service. Comply with applicable governing regulations and industry standards.
  - 1. Interior Soil and Waste Piping: Unless otherwise shown, interior soil and waste piping to a point 5 feet, zero inches outside the building exterior wall line shall be service weight cast iron bell and spigot piping, with joints made up with "Dual-Tite" or "Ty-Seal" neoprene gasketed joints. Above grade, service weight cast-iron plain end pipe, with joints made up with "No-Hub" coupling consisting of neoprene sleeve and stainless steel shield and clamps, torqued in accordance with manufacturer's recommendations. Mfg: Clamp all 125 or Husky SD 4000.
  - 2. Vent Piping: Provide service weight cast iron bell and spigot piping, with joints made up with "Dual-Tite" or "Ty-Seal" neoprene gasketed joints. Above grade, service weight cast-iron plain end pip, with joints made up with "No-Hub" coupling consisting of neoprene sleeve and stainless steel corrugated shield and clamps, torqued in accordance with manufacturer's recommendations.
  - 3. Storm Drain Piping: Provide piping similar to waste and soil piping specified hereinabove.
  - 4. Domestic Water Piping: Provide hard drawn copper tubing for all domestic water piping 3" and smaller, including cold water, hot water and recirculating lines. Joints shall be soldered with lead free wrought copper solder, ANSI B16.22 suitable for working pressure up to 250 psig. Cored

solder will not be allowed, all solder shall be solid string or wire type. Piping larger than 3" shall be cast iron with mechanical joints with appropriate gaskets, nuts and bolts.

5. Gas Piping: Provide standard weight black steel. All intermediate pressure pipe and all fittings 2" and larger shall have welded joints. Fittings 1-1/2" and smaller shall have standard weight black malleable iron screwed. Fittings 2" and larger shall have "Tube Turn" forged welding type, or approved equal.

## 2.2 PIPE/TUBE FITTINGS:

- A. General: Provide factory-fabricated fittings of type, materials, grade, class, and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve, and equipment connections. Where not otherwise indicated, comply with governing regulations, industry standards, and where applicable, with pipe manufacturer's instructions for selections.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION:

- A. Industry Practices: Install pipe, tube, and fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without failure or degradation of service. Install each run with a minimum of joints and couplings, but with adequate and accessible unions or flanged connections to permit disassembly for maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align accurately at connections, within 1/16" misalignment tolerance. Coordinate piping locations with other trades to avoid conflict. Give ductwork preference unless directed otherwise by the Engineer.
- B. Systems: Install piping parallel or perpendicular to lines of building, true to line and grade, and with sufficient hangers to prevent sags between hangers. Provide fittings at changes in direction. Piping in finished areas shall be concealed, except in mechanical rooms. Where pipes of different sizes join, provide reducing elbows, tees, or couplings. Bushings will not be acceptable.
- C. Pipe Layout: All piping shall be installed in accordance with Plans and Specifications and according to all applicable local and state codes. Minor piping revisions due to substituted equipment are acceptable provided they are indicated on piping fabrication drawings. All the various piping systems shall be made up straight and true and run at proper grades to permit proper flow of the contained material. Lines shall also be graded for proper drainage. Piping shall follow as closely as possible the routes shown on Drawings which take into consideration conditions to be met at the site. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after proper approval has been obtained. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which the lines are connected. All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary, and all rust or dirt from storage or from laying on the ground shall be removed.
- D. Concealed and Exposed Piping: All piping in finished areas shall be concealed, unless otherwise noted. Piping exposed in mechanical rooms and other locations as noted shall be installed in an orderly manner and parallel with or perpendicular to building lines. Exposed piping in occupied areas shall be routed tight to the structure or as high as is possible.
- E. Expansion and Contraction: Install loops, offsets, sizing joints, and expansion joints, as necessary, to avoid strain resulting from expansion and contraction of piping systems on fixtures and equipment.
  1. Expansion Loops and Offsets: Provide expansion loops and offsets in piping systems for not less than one inch (1") expansion or contraction per 100' of pipe.
- F. Steel Pipe: Ream steel pipe after cutting and before threading. Thread with clean-cut taper threads of length to engage all threads in fittings and leave no full-cut threads exposed after make-up. Use John Crane or approved equal teflon thread tape applied only to male threads to make-up joints.

- G. Copper Pipe: Cut copper pipe square and ream to remove burrs. Clean fitting socket and pipe ends with sand cloth, No. 00 cleaning pads or wire brush. No acids shall be used to clean either pipe or fittings or as a flux in sweating joints. The use of drilled T connections is not permitted.
- H. Final Connections to Equipment Furnished by Owner or Under Other Divisions of These Specifications: Where Drawings show equipment to be furnished under other Divisions of these Specifications or by the Owner, such equipment will be delivered to the site, uncrated, assembled, and set in-place under those other Divisions of these Specifications or under the separate contracts. Any required automatic control valves shall also be provided under those other Divisions of these Specifications or other separate contracts. Make all final connections of chilled water, hot water, condenser water, gas, domestic water, waste, and vent as shown. Provide valves, unions, strainers, check valves, and traps as required for proper operation of systems and equipment. Equipment not shown or noted on the piping drawings shall not be included in the scope of this requirement.
- I. Grading: All piping shall be carefully installed so as to eliminate traps and pockets in pressurized lines and to maintain flow in gravity flow lines. Where air pockets and traps cannot be avoided, provide valved hose connections for water traps and valved automatic air vents for air traps. The Contractor shall consider pipe grading requirements when coordinating pipe routing for the project. Pipe slope shall be maintained throughout the project. Waste and vent piping shall be sloped in accordance with the applicable codes. Pressurized plumbing piping systems shall be sloped to drain points.
- J. Pipe Grading: Install domestic water piping to pitch down in the direction of flow for drainage. Grade storm, soil, and waste piping at 1/4" per foot whenever possible, and not in any case less than 1/8" per foot for pipe sizes 4" and larger, unless shown otherwise on the Drawings. Grade vent piping at 1/4" per foot whenever possible, and not in any case less than 1/8" per foot toward vents. Grade gas piping at a minimum of 1/8" per foot toward condensation traps at connected equipment.
- K. Arrangement: Flanges or unions, as applicable for the type of piping specified, shall be provided in the piping at connections to all items of equipment. All valves and specialties shall be placed to permit easy and proper operation and access, and all valves shall be regulated, packed and glands adjusted at the completion of the work before final acceptance. Tapered reducers shall be used wherever changes in pipe sizes occur in mains. Bushings will not be permitted. The use of bull head tees or other high pressure drop configurations will not be permitted.
- L. Anchors: Pipe anchors shall be provided and installed at each end of piping runs which require expansion loops or joints, and where indicated on Drawings. Anchors shall be fabricated of rigid structured steel members firmly secured to the building structure.
- M. Protection: All open ends of pipes and equipment shall be properly capped or plugged during construction to keep dirt and other foreign materials out of the system. Plugs of rags, wool, cotton, waste or similar materials are not acceptable.
- N. Pipe Sizes: If the size of the piping is not clearly evident in the Drawings, the Contractor shall request instruction as to the proper sizing.
- O. Make-up lead and oakum joints with molten lead run into hubs in one continuous pour, to a minimum depth of one inch (1").
- P. Make-up "Ty-Seal" or "Dual-Tite" gasketed joints using lubrication and joining tools as instructed by the manufacturers. Base of stacks, horizontal runs under pressure, and gasketed pipe 5" and larger shall be made up using "Lubrifast" joining material.
- Q. Torque "No-Hub" joints in accordance with manufacturer's instructions. Do not install "No-Hub" joints below ground.
- R. Provide chrome-plated piping at each fixture installed in a finished space. Install with proper strap wrenches to avoid marking or defacing.
- S. Provide proper restraints on riser and stack offsets.

### 3.2 DOMESTIC HOT AND COLD WATER PIPING SYSTEMS:

- A. Piping Runouts to Fixtures: Provide piping runouts to fixtures sized to comply with governing regulations. Where not otherwise indicated, provide runouts sized to comply with the following: lavatories - 1/2" hot, 1/2" cold; water closet flush valves - one and one half inch (1-1/2") cold; urinal flush valves - one inch (1") cold; drinking fountains - 1/2" cold. Provide each fixture with a shut-off valve for each supply line. All exposed lines shall be chromium-plated.
- B. Riser Air Chambers: At the top of each main hot and cold water riser, provide an air chamber two pipe sizes larger than riser pipe and 24" high.
- C. Fixture Air Chambers: At each hot and cold water supply pipe at each fixture, provide an air chamber the same size as the fixture branch and not less than 18" high.

### 3.3 STORM AND SANITARY DRAINAGE SYSTEM:

- A. Waste and Vent Piping Underground: All underground waste and vent piping, including turns to the vertical to 12" above the grade floor slab, shall be constructed of service weight (SV) hub and spigot cast iron soil pipe and fittings with **[lead and jute yarned] [or] [positive sealing elastomeric gasket joints.] [Lead and jute joints shall be yarned and then a continuous lead pour shall be made at least one inch (1") deep and caulked three times with tools properly sized for the pipe.] [Elastomeric gaskets shall be installed using an approved gasket lubricant.]** Pour concrete thrust blocks at all below grade turns and offsets for waste piping 6" and larger.
- B. [Vertical] Waste [and Vent] [Stacks] [and Waste] [Piping] Above Grade: Service weight (SV) cast iron pipe and fittings with positive sealing neoprene elastomeric compression type gasket joints. Elastomeric gaskets shall be installed using gasket lubricant. All horizontal stack offsets **[and elbows]** (4" and larger) shall be joint-strapped and supported using riser clamps and threaded rod.
- C. [Horizontal Fixture, Waste and] Vent [Manifolds] [Piping] Above Grade: Connect to the vertical stack with "No-Hub" cast iron soil pipe and fittings assembled with Stainless Steel No-Hub Coupling Assemblies.
- D. Building Storm Drainage Piping Underground: All underground horizontal Storm Water piping including turns to the vertical to 12" above the grade floor slab, shall be constructed of service weight (SV) hub and spigot cast iron soil pipe and fittings with **[lead and jute yarned] [or] [positive sealing neoprene gasket] joints. [Lead and jute joints shall be yarned and then a continuous lead pour shall be made at least one inch (1") deep and caulked three times with tools properly sized for the pipe.] [Elastomeric gaskets shall be installed using an approved gasket lubricant.]** Pour concrete thrust blocks at all below grade turns and offsets. The Building Storm Water System shall extend **[5'-0"]** outside the Building **[to a catch basin as shown on the Drawings]**.
- E. Building Storm Piping Above Grade: All Storm Drainage piping within the Building shall be service weight (SV) cast iron pipe and fittings with positive sealing neoprene elastomeric gasket joints. Elastomeric gaskets shall be installed using an approved gasket lubricant. All horizontal stack offsets **[and all elbows]** shall be joint-strapped and supported using riser clamps and threaded rod.
- F. Insulation: All condensate drains and related piping, roof drain[,], and overflow roof drain bodies and horizontal runs of storm drainage piping within the occupied spaces of the building, shall be insulated as specified in Section 23 07 00.
- G. Cleanouts: Install cleanouts at the base of every drainage stack, all bends and angles, upper terminal of each horizontal drainage pipe, each 90' length of horizontal straight run, where shown on the Drawings and as required by local code.
  - 1. Size: Cleanouts shall be line size for piping up to 4" and 4" size for piping larger than 4".
  - 2. Materials:
    - a. Unfinished area and chases provide J.R.Smith - 4013 cast iron with countersunk slotted head and lead seal plug with heavy duty loose set scoriated cast iron cover.

- b. Finished walls provide J.R.Smith 4435 cast iron with countersunk slotted head, lead seal plug, square smooth finish Nikalloy access cover, 6"X6", nickel brass frame with anchoring lugs.
    - c. Finished floors provide J.R.Smith 4020, 4020-Y for carpeted areas, floor cleanout with adjustable extension housing, cast iron with lead seal plug, round top, access cover and round frame.
  - 3. Access: Provide access doors for access to cleanouts installed in concealed locations.
- H. Fixture Connections:
  - 1. Water Closets: Galvanized castable nipples.
  - 2. Urinals: Copper or cast iron nipples with suitable adapters.
  - 3. Lavatories: Copper or cast iron nipples with suitable adapters.
  - 4. Service Sinks: Brass or cast iron nipples with suitable adapters.
  - 5. Drinking Fountains: Copper or cast iron nipples with suitable adapters.
- 3.4 NATURAL GAS PIPING SYSTEM:
  - A. Code Compliance Products: Comply with local utility company and AGA regulations which require the products used for gas piping work to be selected from lists in certain published standards or coded as indicated.
  - B. Gas Piping: Gas piping intended for operation at pressures of 5 psig or greater shall be ASTM A53, Schedule 40, black steel joined by Schedule 40, black welding fittings. Gas piping, 2-1/2" and smaller, intended for operation at pressures less than 5 psig shall be ASTM A53, Schedule 40, black steel joined by Class 150 socket weld fittings except that Class 150, banded, black malleable iron, threaded fittings maybe used at valves and equipment connection. Gas piping, 3" pipe size and larger, intended for operation at pressures less than 5 psig shall be ASTM A53, Schedule 40, black steel joined by Schedule 40, black welding fittings. Provide condensation traps with removable caps at all equipment connections.
  - C. Concealed Piping and Protection: Gas piping run concealed in walls, chases, or above ceilings shall be installed in a Schedule 20 welded steel sleeve vented to the outside atmosphere. Suitable internal spacers shall be provided. Inaccessible piping shall be all-welded connections. Socket type weld fittings may be used for sleeved gas piping.
  - D. Underground Piping: Gas piping installed below grade shall be coated with Republic Steel Corporation (US) "X-Tru-Coat" high density polyethylene extruded coating, factory-applied with a fluid mastic to a minimum thickness of 0.040". Field welds, joints, and fittings shall be protected with mastic undercoat and by wrapping at least two layers of "X-Tru-Tape" installed as instructed by manufacturer.
  - E. Gas Distribution System Drip Pipes: Drip pipes shall be provided throughout the gas piping systems for the purpose of accumulating moisture and condensate. They shall be sized no smaller than the gas main which they drain in each instance. These drip pipes shall be U-shaped providing an effective water seal of no less than 12" of water. The extremity of each U-shaped drip pipe shall be threaded and capped with a suitably sized, screwed pattern, black, standard weight, malleable iron cap. All drip pipes shall be located in an accessible position so that the condensate may either be pumped from the system or so that a water seal may be provided in the event that the water forming the seal evaporates.
- 3.5 FLOOR DRAINS:
  - A. General: Provide floor drains as manufactured by Josam, J.R.Smith, Zurn or Wade. Refer to plans for schedule
- 3.6 ESCUTCHEON PLATES:

- A. General: Except as otherwise noted, provide chrome-plated brass floor and ceiling escutcheon plates around all pipes, and similar items passing exposed through walls, floors, or ceilings, in any finished spaces except under floor and attic spaces. Plates shall be sized to fit snugly against the outside of the conduit. Plates will not be required for piping where pipe sleeves extend above finished floor. Provide sheet metal trim plates at all penetrations exposed to view of building occupants, unless directed otherwise by the Architect.
- B. Type: Escutcheon plates shall be Dearborn Brass Company, Fig. No. 1149 through 1152.

### 3.7 PENETRATIONS, FLASHING, AND SEALS:

- A. Pipe sleeves, pitch pockets, and flashings compatible with the roofing and waterproofing installation shall be provided for all roof and wall penetrations and roof-mounted equipment and supports. Coordinate flashing details with the Architectural details and the roofing/waterproofing Contractors.
- B. Segmented Annular Seals: Seal the openings around piping which penetrate the exterior construction using segmented annular seals to prevent the entry of water and other foreign material. Segmented annular seals shall be Thunderline Corporation Type LS Series link seals or an approved equal. Seals shall be Style C insulating type for standard service at temperatures up to 250°F. Seals shall be Style T high temperature service at temperatures up to 450°F.

### 3.8 CLEANING, FLUSHING, TESTING AND INSPECTING:

- A. Cleaning: Clean exterior surfaces of installed piping systems and prepare surface for application of any required coatings.
- B. Piping Tests:
  1. General: Blank off equipment during tests. Perform tests before piping is enclosed in walls, floors, partitions or in any other way concealed from view. Tests may be performed in sections. Tests shall be witnessed by the Engineer or Owner's Representative and local inspectors and results presented to the Engineer for acceptance and approval prior to concealing piping from view. Provide all necessary equipment for testing, including pumps and gauges. Refer to Section 15020 for additional requirements.
  2. Domestic Water Systems: Test hot and cold water systems hydrostatically to a pressure of 150 psig or 1-1/2 times working pressure, whichever is greater, for a period of 24 hours. Repair all leaks, replacing materials as necessary, and repeat tests until systems are proven tight.
  3. Soil, Waste and Vent Piping System: Test soil, waste, and vent piping by plugging all openings and filling system to height required by City Plumbing Inspector, but not less than 10' above the level of the pipe being tested, for a minimum of 3 hours. Inspect all joints for leaks, repair all leaks found, and retest until piping is demonstrated to be free from leaks as evidenced by no perceptible lowering of the water level after 3 hours. In addition to water test, apply peppermint or smoke tests, if required by local code.
  4. Storm Drainage Piping System: Test storm drainage piping same as specified for Soil, Waste, and Vent Piping System.
  5. Natural Gas Piping System: Test natural gas piping with compressed air or nitrogen to a pressure of five times the expected service pressure, but not less than 100 psig, for a period of 24 hours. Repair all leaks, replacing materials as necessary, and repeat test until systems are proven absolutely tight. After all pneumatic testing of the entire gas piping system has been completed and all leaks have been repaired and at a time deemed suitable by the Owner's duly authorized representative, the Contractor shall have the gas supply turned on and the gas odorant chemical added by a representative of the gas company, as applicable. The Contractor shall then bleed gas from every riser and every runout until the odor of gas is present at every gas connection.
  6. Flushing: Flush water piping systems with clean water following successful testing.

- C. Disinfection of Water Systems: Disinfect hot and cold water systems as follows: Fill systems with water solution containing 50 ppm available chlorine; allow to stand for 8 hours, opening and closing all valves several times during this period; thoroughly flush; refill and place system in service; ensure a residual chlorine content of 0.2 ppm.
  - D. Cleaning and Adjusting: Thoroughly clean and disinfect all plumbing fixtures, including all exposed trim. Adjust all flush valves for proper flushing, but without excess use of water. Demonstrate to the Engineer that the entire plumbing system and all its components are functioning properly.
  - E. Inspecting: Visually inspect each run of each system for completion of joints, adequate hangers, supports, and inclusion of accessories and appurtenances.
- 3.9 IDENTIFICATION:
- A. Refer to Section 23 01 00 for applicable painting, nameplates, and labeling requirements.

**END OF SECTION 22 10 20**