

SECTION 22 10 00
PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide pipe, pipe fittings, piping specialties, pumps and related items required for complete piping system.
- B. Related Work: The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

- A. General: ASTM, and ANSI Standards are indicated. In addition, special standards are referenced where neither ASTM nor ANSI Standards are applicable.
- B. Labeling: All piping shall be continuously and legibly labeled on each length as required by codes and standards and including as a minimum, country of origin, manufacturer's identification marking, wall thickness designation, and applicable standards and approvals. Fittings shall be labeled as required by the referenced standard. Tubular fixture traps shall be stamped with manufacturer's mark and material thickness.
- C. Potable Water Valves: Potable water piping materials not limited to faucets, mixing valves, or pressure reducing valves. Valves shall meet NSF Standard 61, Section 9, for drinking water faucets and shall be brass construction. Brass components which contact water within the faucet shall be from brass which contains no more than 3 percent lead by dry weight.
- D. Concealed Plastic Piping: No concealed plastic piping inside the building unless approved by Code or Governing Authorities.
- E. Definitions: Where piping fluid is not indicated in the following paragraphs, provide similar piping materials for similar fluids (i.e., "make-up water" = "domestic water"; "wet stand pipe" = "fire sprinkler pipe"; "drainage piping" = "sanitary/storm sewer piping").
- F. Plumbing System Disinfection shall be performed by an experienced, qualified, chemical treatment agency. Mt. Hood Chemical, Chemcoa, or approved alternate.

1.03 STORAGE AND HANDLING

- A. Provide factory-applied end caps on each length of pipe and tube. Maintain end caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.04 SUBMITTALS

- A. Submit catalog data for each product specified.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

- A. Copper Pipe and Tube:
1. Application:
 - a. Domestic water.
 - b. Priming lines.
 2. Pipe: ASTM B88.
 - a. Above Ground Domestic Water: Type L hard temper copper with soldered joints.
 - b. Underground Domestic Water and Priming Lines: Type L soft annealed with no joints or type K hard tempered copper with silver soldered joints.
 3. Fittings: Wrought copper solder-joint fittings, ANSI / ASME B16.22.
- B. Copper Pipe and Tube:
1. Application:
 - a. Domestic water.
 2. Pipe: ASTM B88. Above Ground Domestic Water: Type L hard temper copper.
 3. Sizes 2" and Larger: Rolled groove fittings with UPC approval. Victaulic Copper-Connection or engineer approved equal.
 4. Fittings: Wrought copper grooved end fittings to ANSI B16.22, or cast-bronze to ANSI B16.18. Fittings shall be manufactured to copper-tube dimensions. (Flaring ends to accommodate alternate sized couplings is not permitted).
 5. 2" (DN50) through 8" (DN200): Installation ready coupling with offsetting angle-pattern bolt pads for direct stab installation without field disassembly. Gasket shall be Grade "EHP" EPDM compound with red color code designed for operating temperatures from -30 deg F (-34 deg C) to +250 deg F (+120 deg C). Basis of Design: Victaulic Style 607H.
 6. Sizes 1/2" to 2": Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
- C. Plastic Pipe:
1. Application:
 - a. Below grade domestic water.
 - b. Above grade domestic water when continuously supported per specification and concealed from view.
 - c. Priming lines if covered and protected from damage and light.
 2. Pipe:
 - a. Cross-linked polyethylene (PEX) tubing manufactured by PEX-a or Engel Method for Water Service: Tested/listed to ASTM E84, ASTM F876 and F877, and CSA B137.5 listed certified to NSF standards 14 and 61. Rated for 100 PSI at 180° F. Wirsbo AQUAPEX or approved.
 3. Fittings: Provide fittings of the type matching piping manufacture and recommended by the piping manufacturer for the service indicated. Fittings shall be certified no lead brass. EP fitting is not allowed.
- D. **Cast Iron DWV Pipe:**
1. **Application: 1-1/2" and larger.**
 - a. **Rain drain and overflow**
 2. **Pipe: Hubless cast iron soil pipe, CISPI 301-05/ASTM A 888-05. Produced by American manufacturer only. Foreign produced piping is not allowed.**
 3. **Fittings: Hubless cast iron fittings: CISPI 301-05/ASTM A 888-05.**
 4. **Couplings:**
 - a. **Light Duty: Standard couplings meeting CISPI 310.**

- b. **Medium Duty: No-hub couplings meeting CISPI 310 and incorporating ASTM C 564 gasket, type 304 SS corrugated shield and type 304 SS clamping bands. Two clamping bands on 1-1/2" thru 4" pipe and four bands on 6" thru 10" pipe.**
 - c. **Heavy Duty: No-hub couplings meeting ASTM C 1540, and FM 1680. ASTM C 564 neoprene gasket, type 304 SS corrugated shield and type 304 SS clamping bands. Four bands on 1-1/2" thru 4" pipe and 6 bands on 5" thru 10" pipe.**
 - d. **Couplings to Dissimilar Pipe in Concealed Locations: Fernco "LowFlex" or approved substitute.**
5. **Manufacturers: Cast iron pipe and fittings – AB&I, Charlotte Pipe, Tyler Pipe, or approved. All pipe shall be labeled by the manufacturer.**
- E. **Plastic Pipe – Drain, Waste, Vent (DWV):**
- 1. **Application:**
 - a. **Roof overflow drain piping above grade.**
 - 2. **Pipe:**
 - a. **Acrylonitrile-butadiene-styrene (ABS) (ASTM D3965) plastic drain, waste and vent piping (ASTM F628) and fittings (ASTM D2661) (DWV).**
 - b. **Poly(vinyl chloride) (ASTM D1784) (PVC) plastic drain, waste and vent pipe (ASTM D2665 and D1785) and fittings (ASTM D2665) (DWV).**
 - 3. **Fittings: Provide fittings of the type indicated, matching piping manufacture. Where not otherwise indicated, provide fittings produced and recommended for the service indicated by the piping manufacturer.**

2.02 MISCELLANEOUS PIPING MATERIALS

- A. **Insulating (Dielectric) Fittings: Not allowed. See Section 3.**
- B. **Soldering and Brazing Materials: Provide soldering materials as determined by the installer to comply with installation requirements.**
 - 1. **Tin-Antimony Solder: ASTM B32, Grade 95TA.**
 - 2. **Lead-Free Solder: ASTM B32, Grade HB. Harris "Bridgit" approved.**
 - 3. **Silver Solder: ASTM B32, Grade 96.5TS.**
 - 4. **Flux: Water soluble paste flux.**
 - 5. **Brazing filler rod: BCuP rod to suit conditions.**
- C. **Sleeve Seal: Rubber-link pipe wall and casing closure. Thunderline Link-Seal. For fire rated wall, floor or ceiling penetrations, 3-M "CP-25" caulk, "No. 303" putty and/or "PSS 7904" sealing system.**
- D. **Strainers: "Y-pattern," iron or bronze body rated for pressures indicated with blow-off connection and 20 mesh stainless steel screen.**

2.03 PIPING SPECIALTIES

- A. **Shock Arrester: Precharged bellows or sealed piston type manufactured to meet PDI WH-201 and ASSE 1010 Standards. Size in accordance with PDI procedures. J. R. Smith, PPP, Sioux Chief, Wade, Zurn, Watts, Josam, or approved substitute.**
- B. **Priming Valves:**
 - 1. **Electrically operated priming station with header sized for number of outlets required. Provide with 120v power supply, timer, and solenoid valve tested per UL. Provide with IAPMO approved atmospheric vacuum breaker. Provide in recessed wall box with access door per Section 22 05 00. P.P.P. Inc., PT Series or approved.**
 - 2. **Flow operated valves Jay R. Smith 2699 only. Locate in closets, under counters or in walls behind access panels as specified in Section 22 05 00.**

3. McIntosh Primes: Manufactured for connection to flush valve to be with gasket chrome supply line and wall escutcheon. Sloan VBF-72-A1 only.
 4. Use copper or PEX specified previously for all underground priming lines.
- C. Traps: Except chrome plated fixture traps. Recessed drainage pattern for threaded pipe and same grade as pipe for cast iron and plastic pipe; with cleanout plugs in trap body in all above grade locations.
- D. Pressure Reducing Valve: Single seat type with renewable stainless steel seat and valve. Size and capacity as shown on Drawings. Bronze bodies with screwed connections on valves 2-1/2" and smaller and flanged steel bodies on valves 3" and larger. Install each PRV with strainer on inlet or internal strainer. Leslie, Watts, Cash-Acme, Zurn-Wilkins, or approved substitute.
- E. Backflow Preventer: Where indicated on the Drawings, install a reduced pressure backflow preventer complete with shutoff valves, two separate check valves, differential relief valve, and test cocks. USC Foundation for Cross Connection Control, State Health Officials, and serving utility approved. Bronze bodies on units 2" and smaller, and cast iron bodies with bronze trim on units 2-1/2" and larger.
- F. Backflow Preventer: Where indicated on the Drawings, install a double check backflow preventer complete with shutoff valves, two separate check valves, and test cocks. USC Foundation for Cross Connection Control, State Health Officials, and serving utility approved. Bronze bodies on units 2" and smaller, and cast iron bodies with bronze trim on units 2-1/2" and larger.
- G. Domestic Water Balancing Valve: Balancing fitting with differential pressure taps, lead free brass or bronze body and trim or stainless steel construction. B&G "Circuit Setter" or equivalent, Armstrong, Thrush, Wheatley, Flow Design or approved substitute.
- H. Master Mixing Valve: All lead free certified brass or bronze body with stainless steel parts, thermostatic master control element to fail safe upon cold water or control element failure. Provide with external union angle check stops, strainers, volume control, shutoff valves, dial thermometer. Valve location, arrangement and capacity as shown on plans. Valve shall be ASSE standard 1017 listed for 0.5 gpm minimum flow. Leonard, Lawler, Powers, or approved substitute.**

PART 3 - EXECUTION

3.01 UTILITY SERVICE

- A. Water Service: Connect to water system.

3.02 PIPE INSTALLATION

- A. General: Install pipe, tube and fittings in accordance with recognized industry practices and plumbing code standards. Install each run accurately aligned with a minimum of joints and couplings, but with adequate and accessible unions and flanges for disassembly, maintenance and/or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings.

- B. Piping Runs: Route piping close to and parallel with walls, overhead construction, columns and other structural and permanent-enclosure elements of the building. Install piping plumb and level except where pitched for drainage. If not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building or equipment and avoid diagonal runs. Wherever possible in finished and occupied spaces, conceal piping from view. Do not encase horizontal runs in solid (concrete or CMU) partitions.
- C. Ensure all copper piping is protected from contact with non-copper supports. Provide strut cushion below clamp or 2 layers of UPC listed 10 mil tape.

3.03 PIPING JOINTS

- A. General: Provide joints of the type indicated in each piping system, and where piping and joint as manufactured form a system, utilize only that manufacturer's material.
- B. Solder Copper Tube and Fitting Joints: In accordance ANSI B 828 with recognized industry practice. Cut tube ends squarely. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings. Remove scale, slag, dirt and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. "T-Drill" field formed tees may be utilized where the main is at least two pipe sizes larger than the branch.
- C. Braze Copper Tube and Fitting Joints: Where indicated. Pass a slow stream of dry nitrogen gas through the tubing at all times while brazing to eliminate formation of copper oxide.
- D. Insulating (Dielectric) Fittings: Where the "joining of ferrous and non-ferrous piping", use brass valve or brass nipple with length/nominal diameter ratio of 8 or greater rather than dielectric fitting.
- E. Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.
- F. Line Grades:
 - 1. Drainage Lines: Run at maximum possible grade and in no case less than 1/4" per foot within building.
 - 2. Vents: Pitch for drainage 1/4" per 10'.
 - 3. Water: Pitch to low points and install hose bib drains. 3' minimum depth of ground cover for all lines outside building unless otherwise noted.
- G. Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good installation practice.
- H. Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or equipment.

3.04 MISCELLANEOUS PIPING EQUIPMENT

- A. Strainers: Install in a manner to permit access for cleaning and screen removal and with blow-off valve.
- B. Shock Arrestors: Install at end of mains, in a battery of three or more flush valve-operated fixtures water header, ahead of quick closing and solenoid operated valves. Size per PDI recommendations where size is not indicated. Provide access panels.

- C. Trap Priming: Traps serving floor drains, floor sinks, catch basins, and similar fixtures shall be primed in accordance with Code requirements.

3.05 CLEANING

- A. General: Clean all dirt and construction dust and debris from all mechanical piping systems and leave in a new condition. Touch up paint where necessary.
- B. Disinfection of Domestic Water Piping System:
 - 1. Prior to starting work, verify system is complete and clean.
 - 2. Open all drains and fixtures valves in the building starting with the valve nearest the water service line and permit the water to run clear for 10 minutes to eliminate grease, cuttings, flux, and foreign matter.
 - 3. Inject disinfectant at beginning of water system to be disinfected. Introduce free chlorine in liquid form, throughout system to obtain concentration required by local Public Health Department regulations or 50 to 80 mg/L residual.
 - 4. Bleed water from all potable water outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
 - 5. Maintain disinfectant in system for 24 hours.
 - 6. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
 - 7. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.
 - 8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601. If any sample fails the analysis, repeat the procedure.
 - 9. Include a copy of the bacteriological analysis in the Operating and Maintenance manuals.
 - 10. If allowed by local jurisdiction, testing is acceptable in lieu of treatment.

3.06 TEST

- A. General:
 - 1. Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise concealing piping or connecting fixtures or equipment. Where part of the system must be tested to avoid concealment before the entire system is complete, test that portion separately, same as for entire system.
 - 2. Provide all necessary temporary equipment for testing, including pump and gauges. Remove control devices before testing and do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for the indicated pressure and time.
 - 3. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- B. Repair:
 - 1. Repair piping system sections which fail the required piping test by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemical stop-leak compounds, solder, mastics, or other temporary repair methods.
 - 2. Drain test water from piping systems after testing and repair work has been completed.
- C. Water Piping: Hydrostatic pressure of 100 psig without loss for four hours.

3.07 SUPERVISION AND START-UP

- A. Adjust flush valves, pressure reducing valves, mixing valves, water heater thermostats, and similar equipment.

END OF SECTION 22 10 00