

**SECTION 22 1005
PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer
 - 2. Chemical Resistant Sewer
 - 3. Domestic water
 - 4. Natural Gas
 - 5. Flanges, unions, and couplings.
 - 6. Pipe hangers and supports.
 - 7. Check.
 - 8. Relief valves.
 - 9. Valves

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 22 0510 - General Plumbing Requirements.
- C. Section 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT.
- D. Section 22 0719 - PLUMBING PIPING INSULATION.
- E. Section 22 4010- Plumbing Fixtures

1.03 REFERENCE STANDARDS

- A. NSF/ANSI 372 - American National Standard for procedures in evaluating product compliance with the 0.25% maximum weighted average lead content requirement.
- B. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- G. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.
- H. ASME B31.9 - Building Services Piping; 2014.
- I. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- N. ASTM C 1540-04- Standard Specification for Heavy Duty Shielded Couplings joining Hubless Cast Iron Soil Pipe and Fittings.
- O. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- P. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

- Q. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2015.
- R. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2013.
- S. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.
- T. AWWA C651 - Disinfecting Water Mains; 2005.
- U. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- V. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- W. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- X. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- Y. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2006.
- Z. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- AA. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

- A. Refer to Section 22 0510 - General Plumbing Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Products specified this section to be installed in a potable water system anticipated for human consumption shall be in compliance with the amended Safe Drinking Water Act S.3874, to reduce lead in drinking water. "Reduction of Lead in Drinking Water Act". 0.25% allowable lead content.
- B. Refer to Section 22 0510 - General Plumbing Requirements for installer requirements.
- C. Perform Work in accordance with State of Georgia, standards.
- D. Valves: Manufacturer's name and pressure rating marked on valve body.
- E. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.
- F. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
- G. Perform Work in accordance with State of Georgia plumbing code.
- H. Conform to applicable code for installation of backflow prevention devices.
- I. Disinfection shall be in accordance with Environmental Protection Division, Georgia Department of Natural Resources "Rules for Safe Drinking Water".
- J. Domestic water piping system shall be sterilized, complying with Federal Specifications BB-C-120. Work shall be performed by licensed operator.
- K. Water Sample Certification: Water samples from the sterilized domestic water piping system shall be tested and approved by the local Health Department.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED AND WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665, Schedule 40.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE SLAB ON GRADE:

- A. PVC Pipe: ASTM D 2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.04 WATER PIPING, ABOVE SLAB ON GRADE:

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B 32, alloy Sn95 solder.

2.05 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
 - 2. Joints: NFPA 54, threaded or welded to ASME B31.1.
- B. Valve Connections: 2" and smaller - threaded; 2 1/2" and larger - flanged.

2.06 NATURAL GAS PIPING, WITHIN LABORATORIES

- A. In casework chases before outlets:
 - 1. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
 - 2. Fittings: ASME B16.18, ASME B16.22, wrought copper.
 - 3. Joints: AWS A5.8 classification BCuP-5 Silver Braze. Silver Braze must contain 5% or less Phosphorous.

2.07 NATURAL GAS PIPING, BELOW LABORATORY FLOOR SLAB

- A. Corrugated Stainless Steel Tubing: OmegaFlex TracPipe PS-II. Pre-sleeved corrugated stainless steel tubing. The external polyethylene sleeve shall contain internal vent channels to direct leakage to the end fittings.
 - 1. Fittings: OmegaFlex TracPipe PS-II Auto-Flare Fittings with 1/4" vent port.

2.08 COMPRESSED AIR PIPING

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
- B. Fittings: ASME B16.18, ASME B16.22, wrought copper and bronze.
- C. Joints: AWS A5.8 classification BCuP-5 Silver Braze. Silver Braze must contain 5% or less Phosphorous.

2.09 UNIONS, FLANGES AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
 - 1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier. Provide where connecting ferrous and non-ferrous piping.

2.10 PIPE HANGERS AND SUPPORTS

- A. Manufacturers: Anvil, B-Line, Grinnell, Globe or Michigan. Figure numbers are for Michigan.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis. Figure 400.
 - 2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, loop. Figure 100.
 - 2. Multiple or Trapeze Hangers(Up to 2 inch: Green epoxy coated, cold formed, lipped steel channels, sized for pipe load and span, 1-5/8" x 1-5/8" x 12 gauge minimum, with pipe/tubing clamps, elastomer cushion, spring held, hardened steel nuts and hanger rods.
 - 3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.11 BALL VALVES

- A. Up To and Including 2-1/2 Inches:
 - 1. Manufacturers:
 - a. Apollo; Model 77CLF2 Series
 - b. Crane; Model LF9202
 - c. Ferguson; Model X421
 - d. Hammond; Model UP8911
 - e. Milwaukee; Model UPBA485B
 - f. Red-White Valve Corp.; Model 5049AB
 - g. Stockham; Model LF-S-255-FB-P
 - h. Watts; Model LFFBVS-3C
 - i. American Valve; Model G100S
 - 2. MSS SP-110, NSF-61, 150 WSP, 600 WOG, Brass or Bronze two piece body, Full port, chrome plated brass ball, reinforced teflon seats and stuffing box ring, blow-out proof stem design, adjustable packing gland, zinc coated steel lever handle with vinyl hand grip, Solder ends.
- B. Up To and Including 2-1/2 Inches:
 - 1. Manufacturers:
 - a. Apollo; Model 77CLF1 Series
 - b. Crane; Model LF9201
 - c. Ferguson; Model X420
 - d. Hammond; Model UP8901
 - e. Milwaukee; Model UPBA475B
 - f. Red-White Valve Corp.; Model 5044AB
 - g. Stockham; Model LF-T-255-FB-P
 - h. Watts; Model LFFBV3C
 - i. American Valve; Model G100
 - 2. MSS SP-110, NSF-61, Class 150, 600 psi CWP, Brass or Bronze two piece body, Full port, chrome plated brass ball, reinforced teflon seats and stuffing box ring, blow-out proof stem design, adjustable packing gland, zinc coated steel lever handle with vinyl hand grip, threaded ends.

2.12 GAS VALVES

- A. 2-Inches and smaller
 - 1. Manufacturers:
 - a. Apollo; Model 64:
 - b. Crane; Model 9200 Series:

- c. Hammond; Model 8901
 - d. Milwaukee Valve; Model BA475B
 - e. Stockham; Model S206-UFBR
 - f. Watts; Model FVB-3
- B. MSS SP-110, 600 WOG, B16.44 5 PSIG, Z21.15 1/2 PSIG, Brass/bronze two piece body, full port, teflon packing, chrome plated brass ball, threaded ends.

2.13 FLOW INDICATOR-BALANCER CONTROLS

- A. Manufacturers:
- 1. AAF:
 - 2. Caleffi
 - 3. ITT Bell & Gossett:
 - 4. Armstrong.
 - 5. Taco.
 - 6. Tour & Anderson; Model IMI-TA
 - 7. Watts.
- B. Balancer: Calibrated bronze screwed balance valve with indicating pointer, memory stop, and with pressure taps for connecting differential pressure meter. Pressure taps shall be equipped with caps and integral check valves. Each valve shall have preformed, removable insulation cover. Locate to provide unrestricted flow up and down-stream in accordance with manufacturer's recommendations. Valves shall be ANSI/NSF-61 Annex G Compliant
- C. Meter: Portable differential pressure gauge with flexible tubing, shut-off valves and case. Deliver gauge to Operating Personnel upon completion of testing and balancing. B&G RO-2, AAF PG-1, Taco Circuit Setter meter, Flow Set 300.5, TA Scope, Caleffi.
- D. Balance Valve shall be ANSI/NSF-61 Annex G Compliant.

2.14 SWING CHECK VALVES

- A. 2-Inches and smaller
- 1. Manufacturers:
 - a. Apollo; Model 161SLF
 - b. Crane; Model LF1340
 - c. Hammond Valve; Model UP912
 - d. Milwaukee Valve; Model UP1509
 - e. Nibco, Inc: Model S-413-Y-LF
 - f. Red-White Valve Corp.; Model 237AB
 - g. Stockham; Model LFB-309Y
 - 2. MSS SP-80, NSF-61, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends
- B. 2-Inches and smaller
- 1. Manufacturers:
 - a. Apollo; Model 161TLF
 - b. Crane: Model LF37
 - c. Hammond Valve; Model UP904
 - d. Milwaukee Valve; Model UP509
 - e. Nibco, Inc: Model T-413-Y-LF
 - f. Red-White Valve Corp.; Model 236AB
 - g. Stockham; Model LFB-319Y
 - 2. MSS SP-80, NSF-61, Class 125, bronze body and cap, bronze swing disc with rubber seat, threaded ends

2.15 RELIEF VALVES

- A. Pressure Relief:
- 1. Manufacturers:
 - a. Cla-Val Company: www.cla-val.com.

- b. Henry Technologies: www.henrytech.com.
 - c. Watts Regulator Company: www.wattsregulator.com.
 - d. Conbraco/Apollo; 10-600.
 2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated. Hot water, ASME Section IV Safety Relief.
- B. Temperature and Pressure Relief:
 1. ASME approved in accordance with Unfired Pressure Vessel Code, Section 8, UG-136, Safety and Relief Valves. Route discharge to floor.
 2. Manufacturers:
 - a. Cash Acme;
 - b. Cla-Val Company: www.cla-val.com.
 - c. Henry Technologies: www.henrytech.com.
 - d. Watts Regulator Company: www.wattsregulator.com.
 - e. Conbraco/Apollo; 18-500.

2.16 AIR ADMITTANCE VALVES

- A. Air Admittance shall conform to ASSE 1051 for individual and branch type air admittance valves.
- B. Manufacturers:
 1. Studor; Model Maxi-Vent:
 2. Watts:
 3. Oatey:
- C. Size and install per manufacturers recommendations
- D. Provide Valve with screening on inside and outside to protect membrane from debris and insects. Protective cover for air intake and insulation. Ability to remove condensation away from sealing membrane and lifetime warranty.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Each type of pipe installed shall be by the same manufacturer throughout the building.
- B. Each type of fittings installed shall be by the same manufacturer throughout the building.
- C. Install in accordance with manufacturer's instructions.
- D. Equipment and pipe support upper attachments shall be 3" x 3" x 1/4" steel angles, minimum, spanning structural members unless noted otherwise. Provide inserts and bolts for supporting pipes and equipment from structural members. Attachments shall be to top cord of bar joists. Attach to beams with beam clamps. DO NOT support from roof deck.
- E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- G. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- H. Maintain 4 inch clearance between pipe and fittings after insulation.
- I. Group piping whenever practical at common elevations.

- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- K. Provide access where valves and fittings are not exposed.
- L. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- M. Flush all debris and pipe compound from domestic water system.
- N. Install valves in a readily accessible location.
- O. Install water piping to ASME B31.9.
- P. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- Q. Sleeve pipes passing through partitions, walls and floors. Where pipes pass thru exterior walls, seal opening between sleeve and pipe.
- R. Pipe discharge of each pressure relief valve individually to floor, unless otherwise noted.
- S. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches of each horizontal elbow.
 - 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Use double nuts and lock washers on threaded rod supports.
 - 8. Provide copper plated hangers and supports for copper piping where hanger is in contact with tubing.
 - 9. Prime coat concealed steel hangers and supports not provided with a corrosion resistant finish. Refer to Section 09 9000.
 - 10. Support drainage piping within 12 inches of every joint.
 - 11. Provide rigid sway bracing upstream of all changes in direction greater than 45 degrees for horizontal storm and sanitary drainage piping 4" and larger.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers as shown on drawings.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.
- B. Interior Water Piping: Maintain top of piping level with concentric reducers. Arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.

- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Hanger spacing indicated as maximum span based on pipe material and size. Conform to structural spacing and load capacity of structural support points and provide closer spacing as required.
- B. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Copper Pipe size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum hanger spacing: 5 ft.
 - 2) Hanger rod diameter: 3/8 inches.
 - b. Waste/Vent Pipe size: 2 inches to 3 inches:
 - 1) Maximum hanger spacing: 8 ft.
 - 2) Hanger rod diameter: 1/2 inch.
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum hanger spacing: 5 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION