

SECTION 22 0516

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Packing for Packed Expansion Joints: One set for each joint.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. Metraflex Company: www.metraflex.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Inner Hose: Carbon steel.
- C. Exterior Sleeve: Single braided, stainless steel.
- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Joint: Flanged.
- F. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. Metraflex Company: www.metraflex.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Braided bronze.
- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Joint: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION 22 0516

SECTION 22 0519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermometers and thermometer wells.

1.02 REFERENCE STANDARDS

- A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements. for additional provisions.

1.04 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc: www.omega.com.
 - 3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 - 1. Size: 9 inch (225 mm) scale.
 - 2. Window: Clear Lexan.
 - 3. Accuracy: 2 percent, per ASTM E77.
 - 4. Calibration: Degrees F.

2.02 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.03 TEST PLUGS

- A. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- C. Provide instruments with scale ranges selected according to service with largest appropriate scale.

- D. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- E. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- F. Locate test plugs adjacent thermometers and thermometer sockets.

3.02 SCHEDULES

- A. Stem Type Thermometers, Location and Scale Range:
 - 1. Domestic hot water supply and recirculation, 0 to 180 degrees F (0 to ____ Degrees C).

END OF SECTION 22 0519

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Butterfly valves.
- E. Check valves.
- F. Gate valves.
- G. Globe valves.
- H. Plug valves.
- I. Chainwheels.

1.02 RELATED REQUIREMENTS

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- B. Section 22 0719 - Plumbing Piping Insulation.
- C. Section 22 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.
- D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2009.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- F. ASME B16.34 - Valves-Flanged, Threaded, and Welding End; 2013.
- G. ASME B31.9 - Building Services Piping; 2014.
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2015.
- K. AWWA C606 - Grooved and Shouldered Joints; 2015.
- L. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
- M. MSS SP-67 - Butterfly Valves; 2011.
- N. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
- O. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011.
- P. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- Q. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- R. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- S. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- T. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 - 5. Secure check valves in either the closed position or open position.
 - 6. Adjust butterfly valves to closed or partially closed position.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on Drawings:
 - 1. Shutoff: Ball, butterfly, gate or plug.
 - 2. Throttling: Provide globe, angle, ball, or butterfly.
 - 3. Swing Check (Pump Outlet):
 - a. 2 NPS (50 DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. 2-1/2 NPS (65 DN) and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Domestic, Hot and Cold Water Valves:
 - 1. 2 NPS (50 DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint or threaded ends.
 - b. Ball: One piece, full port, brass or bronze with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.
 - d. Bronze Gate: Class 125, NRS.
 - e. Bronze Globe: Class 125, bronze disc.
 - 2. 2-1/2 NPS (65 DN) and Larger:
 - a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded or flanged ends.
 - b. Iron Ball: Class 150.
 - c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
 - d. Iron Grooved-End Butterfly: 175 CWP.
 - e. Iron Swing Check: Class 125, metal seats.
 - f. Iron Swing Check with Closure Control: Class 125, lever and spring.
 - g. Iron Grooved-End Swing Check: 300 CWP.
 - h. Iron Gate: Class 125, NRS.
 - i. Iron Globe: Class 125.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Handwheel: Valves other than quarter-turn types.
 - 2. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller except plug valves.
 - 3. Wrench: Plug valves with square heads.

- D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.
 - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
 - 5. Grooved End Connections: AWWA C606.
- F. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- G. Valve Materials for Potable Water: NSF 61 and NSF 372.
- H. Bronze Valves:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRASS BALL VALVES

- A. One-Piece, Reduced-Port with Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. Body: Forged brass.
 - 3. Ends: Threaded.
 - 4. Stem: Brass.
 - 5. Ball: Chrome-plated brass.
- B. Two Piece, Full Port with Brass Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig (1035 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Forged brass.
 - 5. Ends: Threaded or soldered.
 - 6. Stem: Brass.
 - 7. Ball: Chrome-plated brass.

2.04 BRONZE BALL VALVES

- A. One Piece, Reduced Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 400 psig (2760 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Bronze.
 - 5. Ends: Threaded.
 - 6. Stem: Bronze.
 - 7. Ball: Chrome plated brass.
- B. Two Piece, Full Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig (1035 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Bronze.

5. Ends: Threaded.
6. Stem: Bronze.
7. Ball: Chrome plated brass.

2.05 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type: Bi-directional dead-end service without use of downstream flange.
 1. Comply with MSS SP-67, Type I.
 2. CWP Rating: 200 psig (1380 kPa).
 3. Body: ASTM A126, cast iron or ASTM A536, ductile iron.
 4. Stem: One or two-piece stainless steel.
 5. Seat: EPDM.
 6. Disc: Coated ductile iron.

2.06 IRON, GROOVED-END BUTTERFLY VALVES

- A. CWP Rating: 175 psig (1200 kPa).
 1. Comply with MSS SP-67, Type I.
 2. Body: Coated ductile iron.
 3. Stem: Two-piece stainless steel.
 4. Disc: Coated ductile iron.
 5. Disc Seal: EPDM.

2.07 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 1. Comply with MSS SP-80, Type 3.
 2. Design: Horizontal flow.
 3. Body: Bronze, ASTM B62.
 4. Ends: Threaded or soldered as indicated.
 5. Disc: Bronze.

2.08 IRON SWING CHECK VALVES

2.09 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125 with Lever and Spring-Closure Control.
 1. Comply with MSS SP-71, Type I.
 2. Description:
 - a. CWP Rating: 200 psig (1380 kPa).
 - b. Design: Clear or full waterway.
 - c. Body: ASTM A126, gray iron with bolted bonnet.
 - d. Ends: Flanged or threaded as indicated.
 - e. Trim: Bronze.
 - f. Gasket: Asbestos free.
 - g. Closer Control: Factory installed, exterior lever, and weight.

2.10 IRON GROOVED-END SWING CHECK VALVES

- A. 300 CWP:
 1. CWP Rating: 300 psig (2070 kPa).
 2. Body: ASTM A536, Grade 65-45-12 ductile iron.
 3. Seal: EPDM.
 4. Disc: Ductile iron.
 5. Coating: Black, non-lead paint.

2.11 BRONZE GATE VALVES

- A. Non-Rising Stem (NRS) or Rising Stem (RS):
 1. Comply with MSS SP-80, Type I.
 2. Class 125: CWP Rating: 200 psig (1380 kPa).
 3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 4. Ends: Threaded or solder joint joint.

5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

2.12 IRON GATE VALVES

- A. NRS or OS & Y:
 1. Comply with MSS SP-70, Type I.
 2. Class 125: CWP Rating: 200 psig: (1380 kPa).
 3. Body: ASTM A126, gray iron with bolted bonnet.
 4. Ends: Flanged.
 5. Trim: Bronze.
 6. Disc: Solid wedge.
 7. Packing and Gasket: Asbestos free.

2.13 BRONZE GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 1. Comply with MSS SP-80, Type 1.
 2. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 3. Ends: Threaded or solder joint.
 4. Stem: Bronze.
 5. Packing: Asbestos free.
 6. Handwheel: Malleable Iron.

2.14 IRON GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 1. Comply with MSS SP-85, Type I.
 2. Body: Gray iron; ASTM A126, with bolted bonnet.
 3. Ends: Flanged.
 4. Trim: Bronze.
 5. Packing and Gasket: Asbestos free.
 6. Operator: Handwheel or chainwheel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION 22 0523

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Tags.
- B. Pumps: Nameplates.
- C. Small-sized Equipment: Tags.
- D. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc.: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/2 inch (13 mm).
 - 3. Background Color: Black.
 - 4. Plastic: Conform to ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 5. Seton Identification Products: www.seton.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Stencils: With clean cut symbols and letters of following size:
 1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
 2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
- C. Stencil Paint: As specified in Section 09 9123, semi-gloss enamel, colors conforming to ASME A13.1.

2.05 PIPE MARKERS

- A. Manufacturers:
 1. Brady Corporation: www.bradycorp.com.
 2. Brimar Industries, Inc: www.pipemarker.com.
 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 4. MIFAB, Inc: www.mifab.com.
 5. Seton Identification Products: www.seton.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- F. Color code as follows:
 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

2.06 CEILING TACKS

- A. Manufacturers:
 1. Craftmark: www.craftmarkid.com.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- C. Color code as follows:
 1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 9123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

- F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- G. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 22 0553

SECTION 22 0716
PLUMBING EQUIPMENT INSULATION

PART 2 PRODUCTS

1.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

END OF SECTION 22 0716

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation: www.knaufusa.com.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com/sle.
 - 5. Owens Corning Corporation: www.ocbuildingspec.com/sle.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).

3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
 1. Aeroflex USA, Inc: www.aeroflexusa.com.
 2. Armacell LLC: www.armacell.us.
 3. K-Flex USA LLC: www.kflexusa.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Inserts and Shields:
 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

- I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1-4 inch (____ mm).
 - 2) Thickness: 1 inch (____ mm).
 - b. Polyethylene Insulation:
 - 1) Pipe Size Range: <1 inch (____ mm).
 - 2) Thickness: 1 inch (____ mm).
2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch (25 mm).
 - b. Polyethylene Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch (25 mm).
3. Domestic Cold Water: 1" Glass Fiber
4. Roof Drain Bodies: 1" glass fiber
5. Roof Drainage Above Grade: 1" Glass Fiber
6. Plumbing Vents Within 10 Feet (3 Meters) of the Exterior: 1" Glass Fiber

END OF SECTION 22 0719

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. Domestic water.
 - 3. Storm water.
 - 4. Flanges, unions, and couplings.
 - 5. Pipe hangers and supports.
 - 6. Valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
- B. Section 22 0553 - Identification for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; The American Society of Mechanical Engineers; 2011.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- D. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2014 (ANSI/ASME B31.1).
- E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2014 (ANSI/ASME B31.9).
- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
- I. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- L. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
- M. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
- N. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- O. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- P. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- Q. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.
- R. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2013a.

- S. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011.
- T. 11
- U. AWWA C606 - Grooved and Shouldered Joints; 2015 (ANSI/AWWA C606).
- V. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
- W. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- X. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- Y. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
- Z. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- AA. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- AB. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- AC. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- AD. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- AE. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- AF. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe; Plastics Pipe Institute; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Valve Repacking Kits: One for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

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 WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

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

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2) Viega LLC: www.viega.com.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.
- B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
 - 1. Manufacturers:
 - a. Uponor, Inc: www.uponorengineering.com/sle.
 - b. Viega LLC: www.viega.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. PPI TR-4 Pressure Design Basis:
 - a. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
 - 3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
 - 4. Joints: ASTM F1960 cold-expansion fittings.

2.05 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.06 STORM WATER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.07 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.08 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.
 - 2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
 - 3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).

4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
 6. Manufacturers:
 - a. Grinnell Products, a Tyco Business: www.grinnell.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.09 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
 4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 6. Other Types: As required.
 7. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.10 BALL VALVES

- A. Manufacturers:
1. Grinnell Products, a Tyco Business: www.grinnell.com.
 2. Nibco, Inc: www.nibco.com.
 3. Uponor, Inc: www.uponorengineering.com/sle.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.11 BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Crane Company: www.cranecpe.com.
 - 2. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches (150 mm) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.12 PIPING SPECIALTIES

- A. Flow Controls:
 - 1. Manufacturers:
 - a. ITT Bell & Gossett: www.bellgossett.com.
 - b. Griswold Controls: www.griswoldcontrols.com.
 - c. Taco, Inc: www.taco-hvac.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
 - 3. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

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. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
- K. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- L. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

- M. Sleeve pipes passing through partitions, walls and floors.
- N. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- O. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as scheduled.
 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.

3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and 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. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- D. Maintain disinfectant in system for 24 hours.
- E. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- F. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- G. Take samples no sooner than 24 hours after flushing, from 2 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION 22 1005

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Hydrants.
- E. Washing machine boxes and valves.
- F. Water hammer arrestors.
- G. Sumps.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 3000 - Plumbing Equipment.
- C. Section 22 4000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

- A. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2008 (Reaffirmed 2012).
- B. ASSE 1011 - Hose Connection Vacuum Breakers; 2004.
- C. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- E. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- F. PDI-WH 201 - Water Hammer Arresters; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Loose Keys for Outside Hose Bibbs: One.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - 2. Josam Company: www.josam.com.
 - 3. Noble Company: www.noblecompany.com/sle.
 - 4. Zurn Industries, LLC: www.zurn.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Drains:
 - 1. Assembly: ASME A112.6.4.
 - 2. Body: Lacquered cast iron with sump.

3. Strainer: Removable polyethylene dome.
4. Accessories: Coordinate with roofing type, refer to Section _____:
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Leveling frame.
 - f. Adjustable extension sleeve for roof insulation.
 - g. Perforated or slotted ballast guard extension for inverted roof.

2.03 CLEANOUTS

- A. Manufacturers:
 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 2. Josam Company: www.josam.com.
 3. Zurn Industries, LLC: www.zurn.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Cleanouts at Interior Finished Floor Areas (CO-3):
- C. Cleanouts at Interior Finished Wall Areas (CO-4):
- D. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

- A. Manufacturers:
 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 2. Watts Regulator Company: www.wattsregulator.com.
 3. Zurn Industries, LLC: www.zurn.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Interior Hose Bibbs:
 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in conformance with ASSE 1011.

2.05 HYDRANTS

- A. Manufacturers:
 1. Arrowhead Brass & Plumbing, LLC: www.arrowheadbrass.com.
 2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 3. Zurn Industries, LLC: www.zurn.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Hydrants:
 1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.06 WASHING MACHINE BOXES AND VALVES

- A. Box Manufacturers:
 1. IPS Corporation/Water-Tite: www.ipscorp.com.
 2. Oatey Supply Chain Services, Inc: www.oatey.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch (50 mm) waste, slip in finishing cover.

2.07 WATER HAMMER ARRESTORS

- A. Manufacturers:
 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Water Hammer Arrestors:
1. Copper construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.08 SUMPS

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com.
 2. Zurn Industries, LLC: www.zurn.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Glass fiber reinforced with required openings and drainage fittings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets.

END OF SECTION 22 1006

SECTION 22 3000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water heaters.
- B. Compression tanks.
- C. Pumps.
 - 1. Circulators.

1.02 REFERENCE STANDARDS

- A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2014.
- B. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2014.
- C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2015.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
 - 1. Indicate heat exchanger dimensions, size of tapings, and performance data.
 - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, and drains.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

- A. A.O. Smith Water Products Co: www.hotwater.com.
- B. Bock Water Heaters, Inc: www.bockwaterheaters.com.

- C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CERTIFICATIONS

- A. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.

2.03 COMMERCIAL GAS FIRED WATER HEATERS

- A. Type: Automatic, natural gas-fired, vertical storage.
- B. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
- C. Accessories: Provide:
 - 1. Water Connections: Brass.
 - 2. Dip tube: Brass.
 - 3. Drain Valve.
 - 4. Anode: Magnesium.

2.04 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig (80 kPa).

2.05 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:
 - 1. Armstrong Pumps Inc: www.armstrongpumps.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. SIHI Group: www.sterlingsihi.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Domestic Water Storage Tanks:
 - 1. Provide steel pipe support, independent of building structural framing members.
 - 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- D. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 22 3000

**SECTION 22 4000
PLUMBING FIXTURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Sinks.
- D. Service sinks.
- E. Electric water coolers.
- F. Bathtubs.
- G. Showers.

1.02 REFERENCE STANDARDS

- A. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.
- B. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2012.
- C. ASME A112.19.2 - Ceramic Plumbing Fixtures; The American Society of Mechanical Engineers; 2013.
- D. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2013).
- E. NSF 61 - Drinking Water System Components - Health Effects; 2014.
- F. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 TANK TYPE WATER CLOSETS

- A. Tank Type Water Closet Manufacturers:
 - 1. American Standard, Inc: www.americanstandard-us.com.
 - 2. Gerber Plumbing Fixtures LLC: www.gerberonline.com.
 - 3. Kohler Company: www.kohler.com.
 - 4. Zurn Industries, Inc: www.zurn.com.

5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
- C. Seat Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Bemis Manufacturing Company: www.bemismfg.com.
 3. Church Seat Company: www.churchseats.com.
 4. Olsonite: www.olsonite.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- D. Seat: Solid molded wood plastic, closed front, brass bolts, with cover.
- E. Handle Height: 44 inches (1117 mm) or less.

2.03 LAVATORIES

- A. Lavatory Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Gerber Plumbing Fixtures LLC: www.gerberonline.com.
 3. Kohler Company: www.kohler.com.
 4. Zurn Industries, Inc: www.zurn.com.
- B. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, 20 by 17 inch (___ by ___ mm) with drillings on 4 inch (100 mm) centers, front overflow, seal of putty, calking, or concealed vinyl gasket.
- C. Supply Faucet Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company: www.kohler.com.
 3. Zurn Industries, Inc: www.zurn.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 1.2 gpm, indexed handles.
- E. Accessories:
 1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
 2. Offset waste with perforated open strainer.
 3. Wheel handle stops.
 4. Flexible supplies.

2.04 SINKS

- A. Sink Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company: www.kohler.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Double Compartment Bowl: ASME A112.19.3; 33 by 22 by 8 inch (____ by ____ by ____ mm) outside dimensions 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 1. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

2.05 BATHTUBS AND SHOWERS

- A. Bathtub Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company: www.kohler.com.
 3. WarmRain
 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Bathtub:
 1. ANSI Z124.1.2; molded glass fiber reinforced polyester, with slip-resistant bottom surface, contoured shape, color as selected.
 2. Length: 60 inches (1525 mm).
 3. Width: 32.5 inches (____ mm).
- C. Bath and Shower Trim: ASME A112.18.1; concealed shower and over rim supply with diverter spout, pressure balanced mixing valve, bent shower arm with adjustable spray ball joint showerhead with maximum 2.0 gallons per minute (____ liters per minute) flow and escutcheon, lever operated pop-up waste and overflow.

2.06 SHOWERS

- A. Shower Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Aqua Glass Corporation: www.aquaglass.com.
 3. Jacuzzi: www.jacuzzi.com.
 4. Kohler Company: www.kohler.com.
 5. WarmRain
 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Cabinet: ANSI Z124.1.2 reinforced glass fiber, 48 by 36 by 81.5 inches (____ by ____ by ____ mm) with integral receptor, soap dish, removable chrome plated strainer, tail piece, color as selected.
- C. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.

2.07 SERVICE SINKS

- A. Service Sink Manufacturers:
 1. Just Manufacturing Company: www.justmfg.com.
 2. Mustee.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Bowl: 24 by 24 by 10 inch (600 by 600 by 250 mm) high white molded stone, floor mounted, with one inch (25 mm) wide shoulders, stainless steel strainer.
- C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- D. Accessories:
 1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
 2. Hose clamp hanger.
 3. Mop hanger.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.

3.04 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

- A. Clean plumbing fixtures and equipment.

END OF SECTION 22 4000