

POWERS FASTENERS

Sample Specification

Section 22 10 xx – Plumbing Piping

The intent of this Sample Specification is to illustrate the use of ICC-ES Acceptance Criteria as reference standards in the proper specification of concrete anchors and fasteners which meet the requirements of the International Building Code. Powers Fasteners assumes no liability for any errors and omissions within this Sample Specification and/or its improper use. Please consult with a design professional prior to specifying any product.

SECTION 22 10 xx PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Storm water.
 - 4. Gas.

1.02 RELATED REQUIREMENTS

- A. Section **31 2316** - <<Excavation; or _____>>.
- B. Section **31 2323** - <<Fill; or _____>>.
- C. Section **31 2316.13** - <<Trenching; or _____>>.
- D. Section **33 1300** - <<Disinfecting of Water Utility Distribution; or _____>>.
- E. Section _____ - _____: Roof penetrations.
- F. Section **07 8400** - <<Firestopping; or _____>>.
- G. Section **08 3100** - <<Access Doors and Panels; or _____>>.
- H. Section **09 9000** - <<Painting and Coating; or _____>>.
- I. Section **22 0548** - <<Vibration and Seismic Controls for Plumbing Piping and Equipment; or _____>>.
- J. Section **22 0553** - <<Identification for Plumbing Piping and Equipment; or _____>>.
- K. Section **22 0719** - <<Plumbing Piping Insulation; or _____>>.
- L. Section **22 0516** - <<Expansion Fittings and Loops for Plumbing Piping; or _____>>.
- M. Section **26 2717** - <<Equipment Wiring; or _____>>: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. 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)**.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; **2005**.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; **1998 (R2006)**.
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; **1998 (R2006)**.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; **2001 (R2005)** (ANSI B16.18).

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- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; **2001 (R2005)**.
- G. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; **2002**.
- H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; **2006**.
- I. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; **2007**.
- J. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; **2007** (ANSI/ASME B31.1).
- K. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; **1968**.
- L. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; **2008** (ANSI/ASME B31.9).
- M. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; **2007**.
- N. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; **2007**.
- O. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings; **1999 (Reapproved 2009)**.
- P. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; **2007**.
- Q. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; **2006**.
- R. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; **2007**.
- S. ASTM B 32 - Standard Specification for Solder Metal; **2004**.
- T. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; **2002**.
- U. ASTM B 43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; **1998 (Reapproved 2004)**.
- V. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed; **2002**.
- W. ASTM B 68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric); **1999 (Reapproved 2005)**.
- X. ASTM B 75 - Standard Specification for Seamless Copper Tube; **2002**.
- Y. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric); **1999 (Reapproved 2005)**.
- Z. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; **2003**.
- AA. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); **2005**.
- AB. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; **2003**.
- AC. ASTM B 302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; **2007**.
- AD. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV); **2002**.

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- AE. ASTM C 4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; **2004 (Reapproved 2009)**.
- AF. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; **2007**.
- AG. ASTM C 14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; **2007**.
- AH. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; **2008**.
- AI. ASTM C 76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); **2008a**.
- AJ. ASTM C 425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; **2004 (Reapproved 2009)**.
- AK. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; **2005a**.
- AL. ASTM C 443M - Standard Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets (Metric); **2007**.
- AM. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; **2003a**.
- AN. ASTM C 700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; **2007a**.
- AO. ASTM C 1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications; **2000 (Reapproved 2005)**.
- AP. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; **2006**.
- AQ. ASTM D 2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; **2004**.
- AR. ASTM D 2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; **2003**.
- AS. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); **2005**.
- AT. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; **2003**.
- AU. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; **2006**.
- AV. ASTM D 2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings; **2007b**.
- AW. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; **2004**.
- AX. ASTM D 2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; **2002 (Reapproved 2009)**.
- AY. ASTM D 2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; **2008**.

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- AZ. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; **2008**.
- BA. ASTM D 2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; **2001 (Reapproved 2009)**.
- BB. ASTM D 2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; **2004**.
- BC. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; **2003**.
- BD. ASTM D 2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; **2005**.
- BE. ASTM D 2846/D 2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; **2006**.
- BF. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; **1996 (Reapproved 2002)**.
- BG. ASTM D 2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; **2001 (Reapproved 2007)**.
- BH. ASTM D 2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; **2001 (Reapproved 2007)**.
- BI. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; **2006**.
- BJ. ASTM D 3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe; **2006**.
- BK. ASTM D 3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; **2006**.
- BL. ASTM D 3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe; **2006**.
- BM. ASTM D 3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications; **2001 (Reapproved 2005)**.
- BN. ASTM F 437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; **2006**.
- BO. ASTM F 438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; **2004**.
- BP. ASTM F 439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; **2006**.
- BQ. ASTM F 441/F 441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; **2002**.
- BR. ASTM F 442/F 442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); **1999 (Reapproved 2005)**.
- BS. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; **2007**.
- BT. ASTM F 493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; **2004**.

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- BU. ASTM F 628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core; **2006**.
- BV. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; **2008**.
- BW. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; **1992 (Reapproved 2008)**.
- BX. ASTM F 1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; **2007**.
- BY. ASTM F 1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe; **2006**.
- BZ. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; **2004 and errata**.
- CA. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; **2005** (ANSI/AWWA C105/A21.5).
- CB. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; **2008**.
- CC. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; **2007** (ANSI/AWWA C111/A21.11).
- CD. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; **2009** (ANSI/AWWA C151/A21.51).
- CE. AWWA C606 - Standard Specification for Grooved and Shouldered Joints; American Water Works Association; **2006**.
- CF. AWWA C651 - Disinfecting Water Mains; American Water Works Association; **2005** (ANSI/AWWA C651).
- CG. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association; **2007** (ANSI/AWWA C900).
- CH. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association; **2008**.
- CI. AWWA C950 - Fiberglass Pressure Pipe; American Water Works Association; **2007** (ANSI/AWWA C950).
- CJ. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; **2005**.
- CK. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; **2004**.
- CL. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; **2009**.
- CM. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; **2006**.
- CN. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; **2010**.
- CO. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; **2009**.

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CP. ICC-ES AC70 - Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements; **2010**.

CQ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2009**.

CR. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2002a**.

CS. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2003**.

CT. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2006**.

CU. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2005**.

CV. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2005a**.

CW. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2008**.

CX. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2002**.

CY. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **2003**.

CZ. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; **1996**.

DA. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; **2009**.

DB. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association; **2008**.

1.04 SUBMITTALS

- A. See Section **01 3000** - Administrative 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; or _____>>**.
- D. 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; Two; or ____>>** for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with **<<State of _____; City of _____; or Municipality of _____>>**, standards.
 - 1. Maintain **<<one copy; or ____ copies>>** on project site.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) **<<and applicable state labor regulations; or None - N/A>>**.

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D. Welder Qualifications: *Certified in accordance with <<ASME (BPV IX); _____; or _____>>.*

E. Identify pipe with marking including size, <<ASTM; or None - N/A>> material classification, <<ASTM; or None - N/A>> specification, <<potable water certification,; or None - N/A>> water pressure rating.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with <<State; Municipality; or _____>> of _____ plumbing code.
- B. Conform to <<applicable; or _____>> code for installation of backflow prevention devices.
- C. Provide certificate of compliance from <<authority having jurisdiction; or _____>> indicating approval of installation of backflow prevention devices.

1.07 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.

1.08 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A 74 <<**extra heavy; or service**>> weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Vitrified Clay Pipe: <<ASTM C 700, Standard Strength; ASTM C 700, Extra Strength; ASTM C 4, Standard; ASTM C 4, Extra Quality; ASTM C 4, Heavy Duty; ASTM C 4, Extra Strength; or _____>>.
 - 1. Fittings: Clay.
 - 2. Joints: Bell-and-spigot, with ASTM C 425 compression joint device.
- C. ABS Pipe: ASTM D 2751 or ASTM F 628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D 2235 cement.
- D. ABS Pipe: ASTM D 2661 or ASTM D 2751.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D 2235 cement.
- E. PVC Pipe: ASTM D 3034 SDR 35.

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1. Fittings: PVC.
 2. Joints: Push-on, using ASTM F 477 elastomeric gaskets.
- F. PVC Pipe: ASTM D 2665 or ASTM D 3034.
1. Fittings: PVC.
 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- G. Concrete Pipe: Nonreinforced, ASTM C 14 (ASTM C 14M) Class **<<1; 2; or 3>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).
- H. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M) **<<None - N/A; , mesh reinforcement; or , bar reinforcement>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).
- I. Copper Tube: ASTM B 306, DWV.
1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.
- J. Copper Tube: ASTM B 88 (ASTM B 88M), Type **<<K (A); or L (B)>>** annealed.
1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A 74 **<<extra heavy; or service>>** weight.
1. Fittings: Cast iron.
 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
1. Fittings: Cast iron.
 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. Copper Tube: ASTM B 306, DWV.
1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.
- D. Copper Tube: ASTM B 88 (ASTM B 88M), Type **<<K (A); L (B); or M (C)>>**.
1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.
- E. ABS Pipe: ASTM D 2751 or ASTM F 628.
1. Fittings: ABS.
 2. Joints: Solvent welded with ASTM D 2235 cement.

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F. ABS Pipe: ASTM D 2661 or ASTM D 2751.

1. Fittings: ABS.
2. Joints: Solvent welded with ASTM D 2235 cement.

G. PVC Pipe: ASTM D 2665 or ASTM D 3034.

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

H. PVC Pipe: ASTM D 2665, ASTM D 3034, or ASTM F 679.

1. Fittings: PVC.
2. Joints: Push-on, using ASTM F 477 elastomeric gaskets.

I. Fiberglass Pipe: ASTM D 3262.

1. Fittings: ASTM D 3840.
2. Joints: Epoxy.

J. Fiberglass Pipe: ASTM D 3754, ASTM D 3517, ASTM D 2996, or ASTM D 2997.

1. Fittings: Custom laminated Fiberglass.
2. Joints: Epoxy.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A 74, service weight.

1. Fittings: Cast iron.
2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B 306, DWV.

1. Fittings: ASME B16.29, wrought copper<<, **or ASME B16.32, solvent; or None - N/A**>>.
2. Joints: ASTM B 32, alloy Sn50 solder.

D. Copper Tube: ASTM B 88 (ASTM B 88M), Type <<**K (A); L (B); or M (C)**>>.

1. Fittings: ASME B16.29, wrought copper<<, **or ASME B16.32, solvent; or None - N/A**>>.
2. Joints: ASTM B 32, alloy Sn50 solder.

E. Copper Pipe: <<**ASTM B 42; or ASTM B 302**>>.

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
2. Joints: ASTM B 32, alloy Sn50 solder.

F. Aluminum DWV Pipe:

1. Fittings: Cast iron.
2. Joints: <<**ASTM C 564; or CISPI 310**>>, thermoplastic rubber coupling and stainless steel clamps.

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- G. Brass Pipe: ASTM B 43, chrome plated.
 - 1. Fittings: ASME B16.23, cast bronze, chrome plated.
 - 2. Joints: Mechanical compression.
- H. Steel Pipe: ASTM A 53/A 53M Schedule 40, galvanized, using one of the following joint types:
 - 1. Flanged Joints: ASME B16.1 cast iron fittings.
 - 2. Threaded Joints: ASME B16.4 cast iron fittings.
 - 3. Threaded Joints: ASME B16.3 malleable iron fittings.
 - 4. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- I. ABS Pipe: ASTM D 2751 or ASTM F 628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D 2235 cement.
- J. ABS Pipe: ASTM D 2661 or ASTM D 2751.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D 2235 cement.
- K. PVC Pipe: ASTM D 2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- L. PVC Pipe: ASTM D 2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- M. PVC Pipe: ASTM D 1785 Schedule 40, or ASTM D 2241 SDR 26 for not less than **150 psi (1034 kPa)** pressure rating.
 - 1. Fittings: ASTM D 2466, PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement.
- N. Fiberglass Pipe: ASTM D 3262.
 - 1. Fittings: ASTM D 3840.
 - 2. Joints: Epoxy.
- O. Fiberglass Pipe: ASTM D 3754, ASTM D 3517, ASTM D 2996, or ASTM D 2997.
 - 1. Fittings: Custom laminated Fiberglass.
 - 2. Joints: Epoxy.

2.04 CHEMICAL RESISTANT SEWER PIPING

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

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- B. ABS Pipe: ASTM D 2751 or ASTM F 628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D 2235 cement.
- C. PVC Pipe: ASTM D 2729 or ASTM D 2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- D. Glass Pipe: ASTM C 1053.
 - 1. Fittings: ASTM C 1053.
 - 2. Joints: Stainless steel compression couplings with tetra-fluoroethylene seal ring.
- E. <<PP; or PPR>> Pipe: Polypropylene << flame retardant; or None - N/A>>.
 - 1. Fittings: Polypropylene.
 - 2. Joints: Electrical resistance fusion.

2.05 WATER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110, ductile or gray iron, standard thickness.
 - 2. Joints: AWWA C111/A21.11, rubber gasket with **3/4 inch (19 mm)** diameter rods.
- B. Copper Pipe: ASTM B 42, <<hard drawn; annealed; or light drawn>>.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: <<ASTM B 32, alloy Sn95 solder.; or AWS A5.8, BCuP copper/silver braze.>>
- C. Copper Pipe: ASTM B 42, annealed.
 - 1. Fittings: ASME B16.26, cast bronze.
 - 2. Joints: Flared.
- D. PE Pipe: ASTM D 2239, or ASTM D 2447 Schedule 40.
 - 1. Fittings: ASTM D 2609, PE.
 - 2. Joints: Mechanical with stainless steel clamp.
- E. PE Pipe: AWWA C901.
- F. PVC Pipe: AWWA C900.
- G. Fiberglass Pipe: AWWA C950.
- H. Polyethylene/Aluminum Composite Pipe: ASTM F 1281 or ASTM F 1282, tested for potable water and residual chlorine use.
 - 1. Fittings and Joints: Brass compression type.

2.06 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B 42, <<hard drawn; annealed; or light drawn>>.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: <<ASTM B 32, alloy Sn95 solder.; or AWS A5.8, BCuP copper/silver braze.>>

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- B. Copper Pipe: ASTM B 42, annealed.
 - 1. Fittings: ASME B16.26, cast bronze.
 - 2. Joints: Flared.
- C. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: Ductile or gray iron, standard thickness.
 - 2. Joints: AWWA C111/A21.11, rubber gasket with **3/4 inch (19 mm)** diameter rods.
- D. PE Pipe: ASTM D 2239, or ASTM D 2447 Schedule 40.
 - 1. Fittings: ASTM D 2609, PE.
 - 2. Joints: Mechanical with stainless steel clamp.
- E. Polyethylene/Aluminum Composite Pipe: ASTM F 1281 or ASTM F 1282, tested for potable water and residual chlorine use.
 - 1. Fittings and Joints: Brass compression type.

2.07 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type <<**M (C); L (B); or K (A)**>>, Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Fittings: Cast iron, coated.
 - 3. Joints: ASTM B 32, alloy Sn95 solder.
 - 4. Joints: Grooved mechanical couplings.
- B. Steel Pipe: ASTM A 53/A 53M Schedule 40, galvanized, using one of the following joint types:
 - 1. Threaded Joints: ASME B16.4 cast iron fittings.
 - 2. Grooved Joints: AWWA C606 grooved pipe, cast iron fittings, and mechanical couplings.
- C. CPVC Pipe: ASTM D 2846/D 2846M, ASTM F 441/F 441M, or ASTM F 442/F 442M.
 - 1. Fittings: CPVC; ASTM D 2846/D 2846M, ASTM F 437, ASTM F 438, or ASTM F 439.
 - 2. Joints: ASTM D 2846/D 2846M, solvent weld with ASTM F 493 solvent cement.
- D. PVC Pipe: ASTM D 1785 or ASTM D 2241.
 - 1. Fittings: ASTM D 2665, PVC.
 - 2. Joints: ASTM D 2846/D 2846M, solvent weld with ASTM F 493 solvent cement.
- E. Polyethylene/Aluminum Composite Pipe: ASTM F 1281 or ASTM F 1282, tested for potable water and residual chlorine use.
 - 1. Fittings and Joints: Brass compression type.

2.08 STORM WATER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A 74 <<**extra heavy; or service**>> weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Copper Tube: ASTM B 306 DWV.

SECTION 22 10 xx PLUMBING PIPING

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.
- C. Vitrified Clay Pipe: ASTM C 700, Standard Strength.
1. Fittings: Clay.
 2. Joints: Bell-and-spigot, with ASTM C 425 compression joint device of either lead and oakum, neoprene gasket system, or neoprene gasket and clamp system.
- D. Concrete Pipe: Nonreinforced, ASTM C 14 (ASTM C 14M) Class **<<1; 2; or 3>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).
- E. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M) **<<None - N/A; , mesh reinforcement; or , bar reinforcement>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).
- F. PVC Pipe: ASTM D 3034 SDR 35.
1. Fittings: PVC.
 2. Joints: Push-on, using ASTM F 477 elastomeric gaskets.
- G. PVC Pipe: ASTM D 2665 or ASTM D 3034.
1. Fittings: PVC.
 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.09 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A 74 **<<extra heavy; or service>>** weight.
1. Fittings: Cast iron.
 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Copper Tube: ASTM B 306, DWV.
1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 2. Joints: ASTM B 32, alloy Sn50 solder.
- D. Concrete Pipe: Nonreinforced, ASTM C 14 (ASTM C 14M) Class **<<1; 2; or 3>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).
- E. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M) **<<None - N/A; , mesh reinforcement; or , bar reinforcement>>**.
1. Fittings: Concrete, as specified for pipe.
 2. Joints: Elastomeric gaskets; ASTM C 443 (ASTM C 443M).

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F. ABS Pipe: ASTM D 2680 or ASTM D 2751.

1. Fittings: ABS.
2. Joints: Solvent welded with ASTM D 2235 cement.

G. PVC Pipe: ASTM D 2665 or ASTM D 3034.

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

H. PVC Pipe: ASTM D 2665, ASTM D 3034, or ASTM F 679.

1. Fittings: PVC.
2. Joints: Push-on, using ASTM F 477 elastomeric gaskets.

2.10 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A 74 <<**extra heavy; or service**>> weight.

1. Fittings: Cast iron.
2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B 306, DWV.

1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
2. Joints: ASTM B 32, alloy Sn50 solder.

D. Aluminum DWV Pipe:

1. Fittings: Cast iron.
2. Joints: <<**ASTM C 564; or CISPI 310**>>, thermoplastic rubber coupling and stainless steel clamps.

E. ABS Pipe: ASTM D 2680 or ASTM D 2751.

1. Fittings: ABS.
2. Joints: Solvent welded with ASTM D 2235 cement.

F. PVC Pipe: ASTM D 2665 or ASTM D 3034.

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

2.11 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.

1. Fittings: ASTM A 234/A 234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped **10 mil (0.25 mm)** polyethylene tape.
2. Joints: <<**ASME B31.1; ASME B31.2; ASME B31.9; or ASME (BPV IX)**>>, welded.

B. Polyethylene Pipe: ASTM D 2513, SDR 11.

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1. Fittings: ASTM D 2683 or ASTM D 2513 socket type.
2. Joints: Fusion welded.

2.12 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.

1. Fittings: ASTM A 234/A 234M, wrought steel welding type.
2. Joints: <<**ASME B31.1; ASME B31.2; ASME B31.9; or ASME (BPV IX)**>>, welded.
3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped **10 mil (0.25 mm)** polyethylene tape.

2.13 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; ASME B31.2; ASME B31.9; or ASME (BPV IX)**>>.

B. Copper Tube: ASTM B 88 (ASTM B 88M), Type <<**K (A); or L (B)**>> annealed.

1. Fittings: ASME B16.26, cast bronze.
2. Joints: Flared.

C. Copper Tube: ASTM B 68 (ASTM B 68M) O50 or O60 temper; or ASTM B 75 (ASTM B 75M) H58 (general purpose) drawn temper.

1. Fittings: ASME B16.26, cast bronze.
2. Joints: Flared.

D. Copper Tube: ASTM B 280, O60 soft annealed.

1. Fittings: ASME B16.26, cast bronze.
2. Joints: Flared.

2.14 PROPANE GAS PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.

1. Fittings: ASTM A 234/A 234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped **10 mil (0.25 mm)** polyethylene tape.
2. Joints: <<**ASME B31.1; ASME B31.2; ASME B31.9; or ASME (BPV IX)**>>, welded.

B. Polyethylene Pipe: ASTM D 2513, SDR 11.

1. Fittings: ASTM D 2683 or ASTM D 2513 socket type.
2. Joints: Fusion welded.

2.15 PROPANE GAS PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.

1. Fittings: ASTM A 234/A 234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped **10 mil (0.25 mm)** polyethylene tape.
2. Joints: <<**ASME B31.1; ASME B31.2; ASME B31.9; or ASME (BPV IX)**>>, welded.

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2.16 PROPANE 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 58, threaded or welded to **<<ASME B31.1; ASME B31.2; ASME B31.9; or ASME (BPV IX)>>**.
- B. Copper Tube: ASTM B 88 (ASTM B 88M), Type **<<K (A); or L (B)>>** annealed.
 - 1. Fittings: ASME B16.26, cast bronze.
 - 2. Joints: Flared.

2.17 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: **<< galvanized; or None - N/A>>**.
 - 3. Gasket Material: EPDM suitable for operating temperature range from **-30 degrees F (-34 degrees C) to 230 degrees F (110 degrees C)**.
 - 4. Gasket Material: Nitrile rubber suitable for operating temperature range from **<<-20 degrees F to 180 degrees F (-29 degrees C to 82 degrees C); _____ degrees (_____ degrees C)>>**.
 - 5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 - 6. When pipe is field grooved, provide coupling manufacturer's grooving tools.
 - 7. Manufacturers:
 - a. Grinnell Mechanical Products/Tyco Fire Suppression & Building Products:
www.grinnell.com.
 - b. _____.
 - c. _____.
 - d. Substitutions: **<<See Section 01 6000 - Product Requirements; or Not permitted>>**.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.18 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping - Drain, Waste, and Vent:

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1. Conform to **<<ASME B31.9; ASTM F 708; MSS SP-58; MSS SP-69; or MSS SP-89>>**.
 2. Hangers for Pipe Sizes **1/2 Inch (15 mm)** to **1-1/2 Inches (40 mm)**: **<<Malleable iron; or Carbon steel>>**, adjustable swivel, split ring.
 3. Hangers for Pipe Sizes **2 Inches (50 mm)** and Over: Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 5. Wall Support for Pipe Sizes to **3 Inches (80 mm)**: Cast iron hook.
 6. Wall Support for Pipe Sizes **4 Inches (100 mm)** and Over: Welded steel bracket and wrought steel clamp.
 7. Vertical Support: Steel riser clamp.
 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- B. Plumbing Piping - Water:
1. Conform to **<<ASME B31.9; ASTM F 708; MSS SP-58; MSS SP-69; or MSS SP-89>>**.
 2. Hangers for Pipe Sizes **1/2 Inch (15 mm)** to **1-1/2 Inches (40 mm)**: **<<Malleable iron; or Carbon steel>>**, adjustable swivel, split ring.
 3. Hangers for Cold Pipe Sizes **2 Inches (50 mm)** and Over: Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes **2 Inches (50 mm)** to **4 Inches (100 mm)**: Carbon steel, adjustable, clevis.
 5. Hangers for Hot Pipe Sizes **6 Inches (150 mm)** and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
 6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
 7. Multiple or Trapeze Hangers for Hot Pipe Sizes **6 Inches (150 mm)** and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
 8. Wall Support for Pipe Sizes to **3 Inches (80 mm)**: Cast iron hook.
 9. Wall Support for Pipe Sizes **4 Inches (100 mm)** and Over: Welded steel bracket and wrought steel clamp.
 10. Wall Support for Hot Pipe Sizes **6 Inches (150 mm)** and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
 11. Vertical Support: Steel riser clamp.
 12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 13. Floor Support for Hot Pipe Sizes to **4 Inches (100 mm)**: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 14. Floor Support for Hot Pipe Sizes **6 Inches (150 mm)** and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
 15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

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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. Powder Actuated Anchors: Complying with ICC-ES AC70.
7. Gas Actuated Anchors: Complying with ICC-ES AC70.
7. Other Types: As required.
8. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com.
 - b. _____.
 - c. _____.
 - d. Substitutions: <<See Section 01 6000 - Product Requirements; or Notpermitted>>.

2.19 GATE VALVES

A. Manufacturers:

1. _____.
2. _____.
3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Up To and Including **3 Inches (80 mm)**:

1. MSS SP-80, <<Class 125; Class 150; or _____>>, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, <<solder; or threaded>> ends.

C. **2 Inches (50 mm)** and Larger:

1. MSS SP-70, <<Class 125; or _____>>, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves **6 inches (150 mm)** and larger mounted over **8 feet (2400 mm)** above floor.

2.20 GLOBE VALVES

A. Manufacturers:

1. _____.
2. _____.
3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Up To and Including **3 Inches (80 mm)**:

1. MSS SP-80, <<Class 125; or _____>>, bronze body, bronze trim, handwheel <<bronze; or teflon>> disc, <<solder; or threaded>> ends.

C. **2 Inches (50 mm)** and Larger:

1. MSS SP-85, <<Class 125; or _____>>, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves **6 inches (150 mm)** and larger mounted over **8 feet (2400 mm)** above floor.

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2.21 BALL VALVES

A. Manufacturers:

1. _____.
2. _____.

3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Construction, **4 Inches (100 mm)** and Smaller: MSS SP-110, Class 150, **400 psi (2760 kPa)** CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle<< **with balancing stops; or None - N/A**>>, <<**solder; or threaded**>> ends<< **with union; or None - N/A**>>.

C. Construction, **4 Inches (100 mm)** and Smaller: MSS SP-110, _____ **psi** (_____ **kPa**) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle<< **with balancing stops; or None - N/A**>> <<**solder or threaded**>> ends<< **with union; or None - N/A**>>.

2.22 PLUG VALVES

A. Manufacturers:

1. << **Model** _____; **or None - N/A**>>.
2. << **Model** _____; **or None - N/A**>>.
3. << **Model** _____; **or None - N/A**>>.

4. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Construction **2-1/2 Inches (65 mm)** and Larger: MSS SP-78, **175 psi (1200 kPa)** CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged <<**or grooved; or None - N/A**>> ends. Provide lever operator with set screw.

C. Construction **2-1/2 Inches (65 mm)** and Larger: MSS SP-78, _____ **psi** (_____ **kPa**) CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged <<**or grooved; or None - N/A**>> ends. Provide lever operator with set screw.

2.23 BUTTERFLY VALVES

A. Manufacturers:

1. _____.
2. _____.

3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Construction **1-1/2 Inches (40 mm)** and Larger: MSS SP-67, <<**200 psi (1380 kPa)**>> _____ **psi** (_____ **kPa**)>> CWP, cast or ductile iron body, <<**nickel-plated ductile iron; aluminum bronze; or elastomer coated ductile iron**>> disc, resilient replaceable <<**EPDM; Buna N; or EPT**>> seat, <<**wafer; lug; or grooved**>> ends, extended neck, <<**10 position lever handle; or infinite position lever handle with memory stop**>>.

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.

2.24 FLOW CONTROLS

A. Manufacturers:

1. _____.

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2. _____.
3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.
- B. Construction: <<Class 125; Class 150; or _____>>, Brass or bronze body with union on inlet <<and outlet; or None - N/A>>, temperature and pressure test plug on inlet <<and outlet; or None - N/A>> <<, blowdown/backflush drain; or None - N/A>>.
- C. 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 psi (24 kPa kPa); _____ psi (_____ kPa)>>.

2.25 SWING CHECK VALVES

- A. Manufacturers:
 1. _____.
 2. _____.
 3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.
- B. Up to <<3 Inches (80 mm); 2 Inches (50 mm); _____ Inches (_____ mm)>>:
 1. MSS SP-80, <<Class 125; or _____>>, bronze body and cap, bronze swing disc with rubber seat, <<solder; or threaded>> ends.
- C. Over <<3 Inches (80 mm); 2 Inches (50 mm); _____ Inches (_____ mm)>>:
 1. MSS SP-71, <<Class 125; or _____>>, iron body, bronze swing disc, <<renewable disc seal and seat; or None - N/A>> flanged <<or grooved; or None - N/A>> ends.

2.26 SPRING LOADED CHECK VALVES

- A. Manufacturers:
 1. _____.
 2. _____.
 3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.
- B. <<Class 125; Class 150; or _____>>, iron body, bronze trim, stainless steel springs, bronze disc, <<Buna N; or _____>> seals, wafer style ends.

2.27 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 1. _____.
 2. _____.
 3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.
- B. Up to **2 Inches (50 mm)**:
 1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforce diaphragm, strainer, threaded <<single union; or double union>> ends.
- C. Over **2 Inches (50 mm)**:
 1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.28 RELIEF VALVES

- A. Pressure Relief:

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1. Manufacturers:

a. _____.

b. _____.

c. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. Manufacturers:

a. _____.

b. _____.

c. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum **210 degrees F (98.9 degrees C)**, capacity ASME (BPV IV) certified and labelled.

2.29 STRAINERS

A. Manufacturers:

A. Manufacturers:

1. _____.

2. _____.

3. Substitutions: <<See Section 01 6000 - Product Requirements; or Not permitted>>.

B. Size **2 inch (50 mm)** and Under:

1. Threaded brass body for **175 psi (1200 kPa)** CWP, Y pattern with **1/32 inch (0.8 mm)** stainless steel perforated screen.

2. Class 150, threaded bronze body **300 psi (2070 kPa)** CWP, Y pattern with **1/32 inch (0.8 mm)** stainless steel perforated screen.

C. Size **1-1/2 inch (40 mm)** to **4 inch (100 mm)**:

1. Class 125, flanged iron body, Y pattern with **1/16 inch (1.6 mm)** stainless steel perforated screen.

D. Size **5 inch (125 mm)** and Larger:

1. Class 125, flanged iron body, basket pattern with **1/8 inch (3.2 mm)** stainless steel perforated screen.

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.; or None - N/A>>

B. Remove scale and dirt, on inside and outside, before assembly.

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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. <<**Refer to Section 22 0719.; or None - N/A**>>
- H. Provide access where valves and fittings are not exposed. <<**Coordinate size and location of access doors with Section 08 3100.; or None - N/A**>>
- I. Establish elevations of buried piping outside the building to ensure not less than _____ **ft** (_____ **m**) of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Section _____.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section **09 9000**.
- N. Excavate in accordance with <<**Section 31 2316; Section 31 2316.13; or _____**>>.
- O. Backfill in accordance with <<**Section 31 2323; Section 31 2316.13; or _____**>>.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- S. Install water piping to ASME B31.9.
- T. Install fuel oil piping to <<**ASME B31.9; or ASME B31.1**>>.
- U. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- V. Sleeve pipes passing through partitions, walls and floors.
- W. 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)**.

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4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut **<<above; flush with top of; or recessed into and grouted flush with>>** slab.
- X. Pipe Hangers and Supports:
1. Install in accordance with **<<ASME B31.9; ASTM F 708; and MSS SP-89>>**.
 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; or None - N/A>>** 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; sheet lead packing between hanger or support and piping; or _____>>**.
 9. Prime coat exposed steel hangers and supports. **<<Refer to Section 09 9000.; or None - N/A>>** Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section **22 0548**.
 11. Support cast iron drainage piping at every joint.

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; ball; or butterfly>>** valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install **<<globe; ball; or butterfly>>** 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 plug valves in **<<natural; or propane>>** gas systems for shut-off service.
- I. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

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- A. Drainage Piping: Establish invert elevations within **<<1/2 inch (10 mm); ___ inch (___ mm)>>** vertically of location indicated and slope to drain at minimum of **<<1/4 inch per foot (1:50); 1/8 inch per foot (1:100); ___ inch per foot (1:___)>>** slope.
- B. Water Piping: Slope at minimum of **<<1/32 inch per foot (1:400); ___ inch per foot (1:___)>>** and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section **33 1300**.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from **<<10; 5; or 2>>** percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

- A. Provide new **<<sanitary; and storm>>** sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved **<<reduced pressure backflow preventer and; double check backflow preventer and; or None - N/A>>** water meter with by-pass valves **<<, pressure reducing valve; or None - N/A>>** **<<, and sand strainer; or None - N/A>>**.
 - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
 - 2. Provide **18 gage (1.20 mm)** galvanized sheet metal sleeve around service main to **6 inch (150 mm)** above floor and **6 feet (1800 mm)** minimum below grade. Size for minimum of **2 inches (50 mm)** of loose batt insulation stuffing.
- C. Provide new gas service **<<complete with gas meter and regulators; or None - N/A>>**. Gas service distribution piping to have initial minimum pressure of **<<7 inch wg (1.75 kPa); 11 inch wg (2.7 kPa); 2 psi (14 kPa); 5 psi (34 kPa); ___ inch wg (___ kPa); ___ psi (___ kPa)>>**. **<<Provide regulators on each line serving gravity type appliances, size in accordance with equipment.; or None - N/A>>**

3.08 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe size: **1/2 inches (15 mm) to 1-1/4 inches (32 mm):**

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- 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)**.
 - d. Pipe size: **4 inches (100 mm) to 6 inches (150 mm)**:
 - 1) Maximum hanger spacing: **10 ft (3 m)**.
 - 2) Hanger rod diameter: **5/8 inch (15 mm)**.
 - e. Pipe size: **8 inches (200 mm) to 12 inches (300 mm)**:
 - 1) Maximum hanger spacing: **14 ft (4.25 m)**.
 - 2) Hanger rod diameter: **7/8 inch (22 mm)**.
 - f. Pipe size: **14 inches and Over (350 mm and Over)**:
 - 1) Maximum hanger spacing: **20 ft (6 m)**.
 - 2) Hanger rod diameter: **1 inch (25 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