

SECTION 22 11 00

FACILITY WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Domestic water piping, within 5 feet of building, unless otherwise indicated.
2. Domestic water piping, above grade.
3. Unions and flanges.
4. Valves.
5. Pressure gages.
6. Pressure gage taps.
7. Thermometers.
8. Flow control valves.
9. Water pressure reducing valves.
10. Relief valves.
11. Strainers.
12. Hose bibs.
13. Meters
14. Hydrants.
15. Recessed valve box.
16. Backflow preventers.
17. Water hammer arrestors.
18. Thermostatic mixing valves.
19. Pressure balanced mixing valves.
20. Bedding and cover materials.

B. Related Sections:

1. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete house keeping pads specified by this section.
2. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
3. Division 08 - Access Doors and Frames: Product requirements for access doors for placement by this section.
4. Division 09 - Painting and Coating: Product and execution requirements for painting specified by this section.
5. Division 23 - Hangers and Supports for HVAC and Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.
6. Division 23 - Vibration and Seismic Controls for HVAC and Plumbing Piping and Equipment: Product requirements for vibration isolators for placement by this section.
7. Division 23 - Identification for HVAC and Plumbing Piping and Equipment: Product requirements for pipe identification and valve tags for placement by this section.
8. Division 23 - HVAC and Plumbing Insulation: Product and execution requirements for pipe insulation.
9. Division 26 - Equipment Wiring Connections: Execution requirements for electric connections to equipment specified by this section.
10. Division 31 - Soils for Earthwork: Soils for backfill in trenches.
11. Division 31 - Aggregates for Earthwork: Aggregate for backfill in trenches.
12. Division 31 - Excavation: Product and execution requirements for excavation and backfill required by this section.
13. Division 31 - Trenching: Execution requirements for trenching required by this section.
14. Division 31 - Fill: Requirements for backfill to be placed by this section.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.

B. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
4. ASME B31.9 - Building Services Piping.
5. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
6. ASME B40.200 - 2008 - Thermometers, Direct Reading and Remote Reading.
7. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
8. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. American Society of Sanitary Engineering:

1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.
2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
3. ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
4. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
5. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
6. ASSE 5013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers (RP) and Reduced Pressure Fire Protection Principle Backflow Preventers (RFP).
7. ASSE 5015 - Performance Requirements for Testing Double Check Backflow Prevention Assemblies (DC) and Double Check Fire Protection Backflow Prevention Assemblies (RPDF).

D. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A182 / A182M - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings and Valves and Parts for High-Temperature Service
3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
5. ASTM A536 - Standard Specification for Ductile Iron Castings.
6. ASTM B32 - Standard Specification for Solder Metal.
7. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
8. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
9. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
10. ASTM E1 - Standard Specification for ASTM Thermometers.
11. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.
12. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

- F. American Water Works Association:
 1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
 4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 6. AWWA C651 - Disinfecting Water Mains.

- G. Manufacturers Standardization Society of the Valve and Fittings Industry:
 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 2. MSS SP 67 - Butterfly Valves.
 3. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 4. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
 5. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 6. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 7. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
 8. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
 9. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
 10. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

- H. National Electrical Manufacturers Association:
 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

- I. Plumbing and Drainage Institute:
 1. PDI WH-201 - Water Hammer Arrester Standard.

- J. Underwriters Laboratories Inc.:
 1. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
 2. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.03 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.

- B. Product Data:
 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
 4. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

- C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of valves and equipment.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Los Angeles County standard.
- B. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 PRE-INSTALLATION MEETINGS

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves not packaged within containers.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for domestic water piping.

1.12 EXTRA MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two packing kits for each size valve, two loose keys for outside hose bibs and hose end vacuum breakers for hose bibs.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Unless Otherwise Noted)

- A. Also refer to pipe materials schedule for systems.
- B. Ductile Iron Pipe: AWWA C151.
 - 1. Fittings: AWWA C110, ductile iron, standard thickness.
 - 2. Joints: AWWA C111, rubber gasket with rods.
 - 3. Jackets: AWWA C105 polyethylene jacket Double layer, half lapped, 20 mil polyethylene tape.
- C. Copper Tubing: ASTM B88, Type K, annealed.
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - 2. Joints: Compression connection or Brazed, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, K, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.03 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Copper Piping: Class 150, bronze unions with soldered joints.
 - 2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - 3. Clearflow fittings and unions, dielectric.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Copper Piping: Class 150, slip-on bronze flanges.
 - 2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.04 GATE VALVES

- A. Manufacturers:
 - 1. Hammond Valve
 - 2. Milwaukee Valve.
 - 3. Stockham Valves & Fittings

- B. 4 inches and Larger: MSS SP 70, Class 125 cast iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.05 GLOBE VALVES

A. Manufacturers:

1. Hammond Valve
2. Milwaukee Valve.
3. Stockham Valves & Fittings

- B. 2 inches and Smaller: MSS SP 80, Class 150 bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition disc, solder or threaded ends.

- C. 2-1/2 inches and Larger: MSS SP 85, Class 125 cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.06 BALL VALVES

A. Manufacturers:

1. Hammond Valve
2. Milwaukee Valve.
3. Stockham Valves & Fittings

- B. 3 inches and Smaller: MSS SP 110, Class 150 bronze, three piece body, chrome plated bronze ball, full port, teflon seats, blow-out proof stem, solder or threaded ends, lever handle, locking lever handle or extended lever handle with balancing stops.

- C. 3 inches and Smaller: 150 psi at 73 degrees F water temperature, maximum service temperature: 140 degrees F ASTM D1784 PVC body and ball, double lever handle, EPDM seals, teflon seats, full port, single union type with socket or threaded ends.

2.07 BUTTERFLY VALVES

A. Manufacturers:

1. Hammond Valve
2. Milwaukee Valve.
3. Stockham Valves & Fittings

- B. 4 inches and Larger: MSS SP 67, Class 200.

1. Body: Cast or ductile iron, wafer, lug or grooved ends, stainless steel stem, extended neck.
2. Disc: Stainless steel.
3. Seat: Resilient replaceable EPDM.
4. Handle and Operator: Infinite position lever handle with memory stop. Furnish gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.08 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Manufacturers:
 - a. Hammond Valve
 - b. Milwaukee Valve.
 - c. Stockham Valves & Fittings
2. 2 inches and Smaller: MSS SP 80, Class 150 bronze body and cap, bronze seat, Buna-N disc, threaded or solder ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125 cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. Manufacturers:
 - a. Hammond Valve
 - b. Milwaukee Valve.
 - c. Stockham Valves & Fittings
2. 2 inches and Smaller: MSS SP 80, Class 250 bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded or solder ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer or glove style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

2.09 PRESSURE GAGES

A. Manufacturers:

1. Marsh Instruments Co.
2. Trelice Corp.
3. Weiss Instrument Inc.

B. Gage: ASME B40.1, UL 393, UL 404 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

1. Case: Stainless steel.
2. Bourdon Tube: Type 316 stainless steel.
3. Dial Size: 4-1/2 inch diameter.
4. Mid-Scale Accuracy: One percent.
5. Scale: Both psi and kPa.
6. Vacuum: Both psi and kPa.

2.10 PRESSURE GAGE TAPS

A. Manufacturers:

1. Marsh Instruments Co.
2. Trelice Corp.
3. Weiss Instrument Inc.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.

- C. Ball Valve: Brass, 1/4 inch NPT for 250 psi.
- D. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.

2.11 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Marsh Instruments Co.
 - 2. Terice Corp.
 - 3. Weiss Instrument Inc.
- B. Thermometer: ASME B40.200-2008, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, adjustable joint with positive locking device.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear glass.
 - 3. Stem: Brass, 3-1/2 inch long.
 - 4. Accuracy: ASTM E77 2 percent.
 - 5. Calibration: Both degrees F and degrees C.

2.12 FLOW CONTROL VALVES

- A. Manufacturers:
 - 1. Griswold
- B. Construction: Class 150 Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, combination blow-down or back-flush drain.
- 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 5 psi.

2.13 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 - 1. Cal-Val Co
 - 2. Watts Regulator Co.
- B. 2 inches and Smaller: MSS SP 80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and double union ends.
- C. 2 inches and Larger: MSS SP 85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.14 RELIEF VALVES

- A. Manufacturers:
 - 1. Watts Regulator Co.
 - 2. Wilkins Regulators Div.
- B. Pressure Relief: ANSI Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

- C. Temperature and Pressure Relief: ANSI Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated temperature relief maximum 210 degrees F, capacity ASME certified and labeled.

2.15 STRAINERS

- A. Manufacturers:
 - 1. Josam Co.
 - 2. Jay R. Smith Manufacturing Co.
 - 3. Keckley
- B. 1-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.
- C. 5 inch and Larger: Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.16 HOSE BIBS

- A. Manufacturers:
 - 1. Acorn
 - 2. Woodford Manufacturing Co.
- B. Interior: Bronze, stainless steel or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lock shield and removable key, integral vacuum breaker in conformance with ASSE 1011.
- C. Interior Mixing: Bronze, stainless steel or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with lock shield and removable key, and vacuum breaker in conformance with ASSE 1011.

2.17 HYDRANTS

- A. Manufacturers:
 - 1. Acorn
 - 2. Woodford Manufacturing Co.
 - 3. Bradley.
- B. Floor Hydrant: ASSE 1019; chrome plated lockable recessed box, hose thread spout, lock shield and removable key and vacuum breaker.

2.18 RECESSED VALVE BOX

- A. Manufacturers:
 - 1. Acorn
 - 2. Woodford Manufacturing Co.
- B. Washing Machine: Plastic preformed rough-in box with brass valves with single lever handle, socket for 2 inch) waste, slip in finishing cover and 25-20 smoke flame rating. 6 inch square with 1/4 turn ball valves.
- C. Refrigerator: Plastic preformed rough-in box with brass valves with wheel handle slip in finishing cover.

2.19 BACKFLOW PREVENTERS

A. Manufacturers:

1. Watts Regulator Co.
2. Cla-val.
3. Wilkins Regulator.

B. Reduced Pressure Backflow Preventers:

1. Comply with ASSE 1013.
2. Bronze body, with bronze internal parts and stainless steel springs.
3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.20 WATER HAMMER ARRESTORS

A. Manufacturers:

1. J. R Smith Co.
2. PPP

B. ASSE 1010; stainless steel construction or Type K copper construction, bellows type sized in accordance with PDI WH-201.

C. Pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.21 THERMOSTATIC MIXING VALVES

A. Manufacturers:

1. Symmons.
2. Powers.
3. Bradley.

B. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

C. Accessories:

1. Check valve on inlets.
2. Volume control shut-off valve on outlet.
3. Stem thermometer on outlet.
4. Strainer stop checks on inlets.

2.22 PRESSURE BALANCED MIXING VALVES

A. Manufacturers:

1. Cla-Val
2. Watts

B. Valve: Chrome plated cast brass body, stainless steel cylinder and integral temperature adjustment.

- C. Accessories:
 - 1. Volume control shut-off valve on outlet.
 - 2. Stem thermometer on outlet.
 - 3. Strainer stop checks on inlets.

2.23 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A1, A2, A3, and A4 as specified in Division 31.
- B. Cover: Fill Type A1, A2, A3, and A4, as specified in Division 31.
- C. Soil Backfill from Above Pipe to Finish Grade: Soil Type S1, S2, as specified in Division 31. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.03 INSTALLATION - THERMOMETERS AND GAGES

- A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping.
- C. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.04 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection to existing piping system size, location, and inverts.
- B. Establish elevations of buried piping with not less than 1 ft of cover.
- C. Establish minimum separation of water from other services and sanitary sewer piping in accordance with code.

- D. Remove scale and dirt on inside of piping before assembly.
- E. Excavate pipe trench in accordance with Division 31
- F. Install pipe to elevation as required.
- G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.
- H. Install pipe on prepared bedding.
- I. Route pipe in straight line.
- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Install shutoff valves in accordance with this Section.
- L. Pipe Cover and Backfilling:
 - 1. Backfill trench in accordance with Division 31.
 - 2. Maintain optimum moisture content of fill material to attain required compaction density.
 - 3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
 - 4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 - 5. Do not use wheeled or tracked vehicles for tamping.

3.05 INSTALLATION - ABOVE GROUND PIPING

- A. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Division 23.
- G. Provide access where valves and components are not accessible. Coordinate size and location of access doors with Division 08.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Install domestic water piping in accordance with ASME B31.9.
- K. Sleeve pipes passing through partitions, walls and floors. Refer to Division 23.
- L. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.

- M. Install unions downstream of equipment or apparatus connections.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Install ball valve for 2-1/2 inches and smaller or butterfly valves for 3 inches and larger for shut-off and to isolate equipment, part of systems, or vertical risers.
- P. Install ball or butterfly valves for throttling, bypass, or manual flow control services.
- Q. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- R. Provide spring loaded check valves on discharge of water pumps.
- S. Provide flow controls in water circulating systems.
- T. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- U. Pipe relief from valves, back-flow preventers and drains to nearest approved receptor.
- V. Test backflow preventers in accordance with ASSE 5013 and 5015.
- W. Install water hammer arrestors complete with accessibility on hot and cold water supply piping to flush valves, supply piping to each fixture or group of fixtures with fixture or equipment with quick closing valves and solenoid valves.

3.06 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test domestic water piping system in accordance with applicable code, local authority having jurisdiction and as indicated.

3.07 CLEANING

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Prior to starting work chlorination, verify system is complete and flushed and clean until free of visible debris.
- C. Verify 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 and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
- E. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

- I. 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.

END OF SECTION