

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

- A. This Section includes domestic cold water, hot water, and hot water recirculation piping, fittings, and specialties within the building to a point 5 feet outside the building.
- B. Contractors Option:
 - 1. The Division 22 contractor may provide mechanically joined plumbing piping systems to connect mechanical joints, couplings, fittings, valves, and related components as an option in lieu of, in whole or in part, copper sweat, brazing, threaded or flanged piping methods. Mechanically joined water distribution piping systems where used shall be provided in compliance with specification Section 221111 "Mechanically Joined Plumbing Piping Systems".
- C. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 22 Section "General Plumbing Requirements," for trenching and backfilling materials and methods for underground piping installations.
 - 2. Division 2 Section "Water Service Systems," for water service piping beginning from 5'-0" outside the building.
 - 3. Division 7 Section "Joint Sealers," for materials and methods for sealing pipe penetrations through basement and foundation walls, and fire and smoke barriers.
 - 4. Division 11 Section "Kitchen and Food Service Equipment," for faucets and valves furnished with the food service and kitchen equipment.
 - 5. Division 12 Section "Laboratory Casework and Fixtures," for laboratory trim installed in the casework.
 - 6. Division 22 Section "Identification, for Plumbing Piping and Equipment" for labeling and identification of water distribution piping.
 - 7. Division 22 Section "Common Work Results for Plumbing," for materials and methods for fire barrier penetrations, wall penetrations and equipment pads.
 - 8. Division 22 Section "Basic Piping Material and Methods," for materials and methods for strainers, flexible connectors, unions, dielectric unions, dielectric flanges, and mechanical sleeve seals.
 - 9. Division 22 Section "General Duty Valves for Plumbing Piping," for materials and methods for installing water distribution piping valves.
 - 10. Division 22 Section "Hangers and Supports for Plumbing Piping," for insulation shields, materials, and methods for hanging and supporting water distribution piping.
 - 11. Division 22 Section "Plumbing Insulation," for materials and methods for insulating water distribution piping.

12. Division 22 Section "Sanitary Drainage and Vent Piping and Specialties," for material and methods for trap primer outlet piping.

D. Products installed but not furnished under this Section include water meters that will be provided by the utility company to the site and ready for installation. Following is the name and address of the utility company:

1.02 DEFINITIONS

- A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distribution pipe of the building served.
- C. Pipe sizes used in this Specification are nominal pipe size (NPS).
- D. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content $\leq 0.25\%$ per Safe Drinking Water Act as amended January 4th, 2011 Section 1417.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.
 - 1. Product data for each piping specialty and valve specified.
 - 2. Welder Certificates signed by Contractor certifying that welders comply with requirements specified in Article "Quality Assurance" below.
 - 3. Certification of Compliance with ASME and UL fabrication requirements specified in Article "Quality Assurance" below.
 - 4. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."
 - 5. Test reports specified in Part 3 of this Section.
 - 6. Submit certification that specialties and fittings for domestic water distribution for drinking or cooking comply with NSF 61 Annex G and / or NSF 372. The following specialties need not comply:
 - a) Hose bibbs
 - b) Wall, yard, and roof hydrants

- c) Backflow preventers isolating irrigation or mechanical make-up systems
- d) Emergency mixing valves
- e) Trap primers

1.04 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."
- B. Regulatory Requirements: Comply with the provisions of the following codes:
 - 1. ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.
 - 2. ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications" for Qualifications for Welding Processes and Operators.
- C. Comply with NSF 61 Annex G and / or NSF 372 for wetted surfaces of specialties and fittings containing no more than 0.25% lead by weight for domestic water distribution for drinking or cooking.
- D. Pipe, fittings, and specialties shall be manufactured in the United States or be certified to meet ASTM and ANSI standards.

1.05 SPARE PARTS

- A. Maintenance Stock: Furnish one valve key for each key-operated wall hydrant, hose bibb, fixture supply, or faucet installed.

PART 2 - PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Automatic Flow Control Valves:
 - a) Calefi
 - b) Flow Design, Inc., Autoflow Div.
 - c) Victaulic Company
 - 2. Hose Bibbs with Vacuum Breaker:
 - a) Chicago Faucet Co.
 - b) Eljer, A Household International Company
 - c) T & S Brass & Bronze Works, Inc.
 - 3. Wall/Yard Hydrants:

- a) Josam Co.
 - b) Mifab Manufacturing, Inc.
 - c) Smith (Jay R.) Mfg. Co.
 - d) Prier, Inc.
 - e) Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
 - f) Watts Drainage
 - g) Woodford Mfg. Co.
 - h) Zurn Industries Inc., Hydromechanics Div.
4. Backflow Preventers:
- a) Cla-Val Co.
 - b) Conbraco Industries, Inc.
 - c) Febco
 - d) Hersey Products, Inc.
 - e) Mifab Manufacturing, Inc./Beeco
 - f) Watts Regulator Co.
 - g) Zurn Industries Inc. Wilkins Regulator Div.
5. Self Contained Pressure-Reducing Valves:
- a) Cash (A. W.) Valve Mfg. Corp.
 - b) Cla-Val Co.
 - c) Conbraco Industries, Inc.
 - d) Mifab Manufacturing, Inc./Beeco
 - e) Watts Regulator Co.
 - f) Zurn Industries Inc., Wilkins Regulator Div.
6. Water Meters:
- a) Badger Meter, Inc.
 - b) Hays Div., Romac Industries
 - c) Hersey Products, Inc.
 - d) Neptune Water Meter Co.; Subs. Neptune Intl. Corp.
 - e) Rockwell Intl.; Measurement & Flow Control Div.
7. Piston Type Water Hammer Arresters:
- a) Amtrol, Inc.
 - b) Josam Co.
 - c) Precision Plumbing Products, Inc.
 - d) PROFLO
 - e) Sioux Chief Manufacturing Co.
 - f) Tyler Pipe/Wade Div.; Subs. of Tyler Corp.
 - g) Watts Regulator Co.
 - h) Zurn Industries, Inc. Wilkins Regulator Div.
8. Point of Use Thermostatic Mixing Valves
- a) Acorn Engineering Co.
 - b) Cash Acme
 - c) Leonard Valve Co.

- d) Powers Process Controls
- 9. Emergency Mixing Valves
 - a) Acorn Engineering Co.
 - b) Bradley
 - c) Haws Corp.
 - d) Lawler Manufacturing Co., Inc.
 - e) Leonard Valve Co.
 - f) Stingray Systems
- 10. Trap Primers and Distribution Units
 - a) Mifab Manufacturing, Inc.
 - b) Precision Plumbing Products, Inc.
 - c) PROFLO
 - d) Sioux Chief
- 11. Plumbing Pipe Support Brackets
 - a) Holdrite
 - b) PROFLO
 - c) Sioux Chief
- 12. Tube Suspension Clamps
 - a) PROFLO
 - b) Sioux Chief or approved Equivalent

2.02 PIPE AND TUBE MATERIALS, GENERAL

- A. Pipe and Tube: Refer to Part 3, Articles "Above Ground Water Distribution Pipe and Fittings" or "Below Ground Water Distribution Pipe and Fittings", for identification of systems where the materials listed below are used.
- B. Copper Tube: ASTM B88, Type L Water Tube, drawn temper.
- C. Copper Tube: ASTM B88, Type K Water Tube, annealed temper.
- D. Ductile-Iron Pipe: AWWA C151 or AWWA C115 ductile-iron pipe, with AWWA C104 cement-mortar lining.
- E. Brass Pipe: Chrome Plated Schedule 40 ASTM B43 iron pipe size (IPS.)

2.03 FITTINGS

- A. Wrought Copper Solder-Joint Fittings: ANSI B16.22, streamlined pattern.
- B. Ductile or Gray-Iron Flanged Fittings: AWWA C110 Class 125 with AWWA C116 epoxy coating inside and outside.

- C. Ductile-Iron Gasketed Fittings: AWWA C153, 150 psi rating, with AWWA C104 cement mortar lining and AWWA C111 rubber gaskets.
- D. Brass Fittings: Chrome plated ANSI B16, Class 125 with threaded connections.
- E. Cast-Iron Threaded Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.
- F. Bronze Flanges: ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.

2.04 JOINING MATERIALS

- A. Solder Filler Metal: ASTM B32 Alloy Sb-5, 95-5 Tin-Antimony.
- B. Brazing Filler Metals: AWS A5.8, BAg Silver.
- C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and design temperatures and pressures.

2.05 GENERAL-DUTY VALVES

- A. General-duty valves (i.e., check, ball, and butterfly valves) are specified in Division 22 Section "General Duty Valves for Plumbing Piping." Special duty valves are specified below by their generic name; refer to Part 3, Article "Valve Applications" for specific uses and applications for each valve specified.

2.06 SPECIAL DUTY VALVES

- A. Automatic Flow Control Valves: 400 PSI WOG, flow regulator, with series 300 stainless steel body, series 300 stainless steel automatic pre-set flow balancing cartridge, union connection body, and threaded-end connections.

2.07 PIPING SPECIALTIES

- A. Hose Connections: Hose connections shall have garden hose thread outlets conforming to ASME B1.20.7.
- B. Hose Bibbs: Bronze body, renewable composition disc, tee handle, 1/2- or 3/4-inch solder inlet, hose outlet.
- C. Hose Bibbs: Bronze body with chrome- or nickel-plated finish, with renewable composition disc, wheel handle, 1/2- or 3/4-inch solder inlet, hose outlet.
- D. Recessed Nonfreeze Wall Hydrants: Cast-bronze box, with chrome-plated face, tee handle key, vacuum breaker, hinged locking cover, 3/4-inch inlet, and hose outlet. Bronze casing shall be length to suit wall thickness.
- E. Roof Hydrants: As specified on the drawings.

- F. Backflow Preventers: Comply with requirements of ASSE Standard 1013 and as specified on the drawings.
- G. Pressure Reducing Valves: Comply with requirements of ASSE Standard 1003 and as specified on the drawings.
- H. Flood Control Valves: As specified on the drawings.
- I. Water Meters: Provide water meters with registration in gallons.
 - 1. Water Meter - 2 Inches And Smaller: Disc type conforming to AWWA C700.
 - 2. Remote Registration System: Utility company standards.
- J. Piston Type Water Hammer Arresters: Piston type, with casing of type “L” copper tube and spun copper ends, nylon piston with two EPDM “O”rings pressure lubricated with FDA approved silicone, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
- K. Point of Use Thermostatic Mixing Valves:
 - 1. Lead free bronze or brass body meeting ASTM B584 with non-corrosive parts, tamper resistant temperature adjustment, checks, stops, other components as scheduled and meeting ASSE 1070. Valve shall be designed to fail to the cold side of the system. Maximum pressure drop shall not be exceeded for the scheduled flow rate.
- L. Emergency Mixing Valves:
 - 1. Bronze body construction meeting ASTM B584, non-corrosive parts, tamper resistant temperature adjustment, union inlets. Valve shall be designed to fail to the cold side of the system with full cold water flow. Maximum pressure drop shall not be exceeded for the scheduled flow rate.
- M. Pipe Support Brackets:
 - 1. Sheet Stud Bracket: 20 gauge copper with nominal copper tube holes of 1/2” on 2” centers and holes of 3/4” or 1” on 4” centers.
 - 2. Pipe Mounted Bracket: 20 gauge copper or plastic bracket with clamps for securing copper water tube and stainless steel hose clamp for securing bracket to vertical waste and vent pipe in wall.
 - 3. Carrier Bracket: 20 gauge copper bracket with 1” hole for supporting rough-in for flush valve copper tube and bolt slot for attaching to chair carrier.
- N. Tube Suspension Clamps
 - 1. Combination plastic supports and insulators for installing copper tube in stud walls with integral bracket for securing to stud with screws.

PART 3 - EXECUTION

1.1 INSTALLATION, GENERAL

- A. Install piping, valves and specialties in accordance with manufacturer's installation instructions.

3.02 PREPARATION FOUNDATION FOR BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS

- A. Copper Tube: Provide 6" thick sand pipe bed underneath and around sides of pipe, up to middle half of the pipe. Support pipe in trench with sand bags level and true at fittings to prevent sand, gravel or debris from interfering with the brazing process. After pressure testing is complete, install bedding at fittings and install subbase. Refer to Section "General Plumbing Requirements" for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.
- B. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand bedding. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. For piping with rock trench bottoms, provide sand pipe bed 6" underneath and around sides of pipe up to middle half of the pipe, including fittings. After pressure testing is complete, provide first layer of pea gravel backfill 6" above pipe, tamp backfill with mechanical tamper and install bedding at fittings and install subbase. Refer to Section "General Plumbing Requirements" for bedding and subbase materials, excavation, trenching, backfill and compaction requirements.

3.03 ABOVE GROUND WATER DISTRIBUTION PIPE AND FITTINGS

- A. Install Type L, drawn copper tube with wrought copper fittings and solder joints for pipe sizes 8 inches and smaller, within the building.
- B. Install chrome plated brass pipe and fittings for exposed water piping within the building where indicated on the drawings.
- C. Install ductile or gray-iron epoxy coated fittings for 3" and larger at water service entrance riser and only upstream of the backflow preventer.

3.04 BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS

- A. Install Type K, soft annealed copper tube and brazed joints for pipe sizes 2 inches and smaller, with minimum number of joints, inside and outside building.
- B. Install cement-lined ductile-iron pipe with rubber gasketed joints, inside and outside under the building, for pipe 3 inches and larger.

3.05 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Use fittings for all changes in direction and branch connections.
- C. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- F. Install horizontal piping as high as possible allowing for proper slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.
- I. Fire Barrier Penetrations: Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 22 Section “Common Work Results for Plumbing” for special sealers and materials.
- J. Exterior Wall Penetrations: Seal pipe penetrations through exterior wall constructions with sleeves packing, and sealant. Refer to Division 22 Section “Basic Piping Materials and Methods” for additional information.
- K. Underground Exterior Wall Penetrations: Seal pipe penetrations through underground exterior walls with sleeves and mechanical sleeve seals. Refer to Division 22 Section “Basic Piping Materials and Methods” for additional information.
- L. Elevated Floor Penetrations of Waterproof Membrane, Interior Penetrations of Non-Fire Rated Walls and Concrete Slab on Grade Penetrations: Provide sleeves and seal pipes that pass through waterproof floors, non-fire rated walls, partitions

and ceilings or concrete slab on grade. Refer to Division 22 Section "Basic Piping Materials and Methods" for special sealers and materials.

- M. Install piping level with no pitch.

3.06 HANGERS AND SUPPORTS

- A. General: Hanger, support, insulation protection shield and anchor components and installation procedures conforming to MSS SP-58 and SP-69 are specified in Division 22 Section "Hangers and Supports for Plumbing Piping". Conform to the table below for maximum spacing of supports.
- B. Pipe Attachments: Install the following:
 - 1. Adjustable steel clevis hangers, MSS SP-69 Type 1, for individual horizontal runs.
 - 2. Riser clamps, MSS SP-69 Type 8, for individual vertical runs. Provide copper coated riser clamps when in contact with copper tube.
 - 3. Insulation protection shields and high density insulation at each hanger for insulated pipe as specified in Division 22 Sections "Supports and Anchors" and "Plumbing Insulation".
 - 4. Copper coated extension split ring pipe clamp, MSS SP-69 Type 12, for individual vertical exposed runs of copper tube 2" and smaller on walls and for securing 1-1/4" to 2" copper tube inside walls and chases for battery fixtures. Secure clamp to the copper tube.
 - a) Seal each joint with insulation and split ring pipe to maintain the insulation barrier. Refer to Section "Plumbing Insulation" for requirement for maintenance of the vapor barrier and vapor barrier seal method.
 - 5. Extension split ring pipe clamp, MSS SP-69 Type 12, for individual vertical exposed runs of stainless steel tube 2" and smaller on walls or for securing tube inside walls for connection to faucets.
 - 6. Support copper tube in chases and walls at plumbing fixtures with plastic or copper brackets secured to structure and U-bolts sized to bare on the pipe.
 - 7. Engineered strut support system may be provided, at the contractor's option, in lieu of individual hangers for horizontal pipes as specified in Division 22 "Hangers and Supports for Plumbing Piping". Provide two piece straps for uninsulated pipe secured to the bare pipe and provide plastic galvanic isolators for bare copper tube. Provide two piece straps and 360° insulation protection shields sized for the insulation thickness used for the pipe for all insulated pipes.
 - 8. Secure copper tube rough-in for individual fixtures with sheet stud brackets attached to the wall studs or pipe mounting brackets attached to the fixture waste & vent pipe at each plumbing fixture.
 - 9. Secure 1" and smaller copper water tubing in stud walls at stud penetrations with tube suspension clamps.

- a) Cut hole through non-supporting studs with a minimum 1/8" clearance around each uninsulated copper tube or insulated copper tube.
 - b) Seal each joint of insulation and tube suspension clamp to maintain the insulation barrier. Refer to Division 22 "Plumbing Insulation" for requirement for maintenance of the vapor barrier similar to insulation butted against insulation inserts and vapor barrier seal method.
10. Secure copper tubes for flush valve wall mounted water closets to the chair carrier with carrier brackets.
11. Provide roll hangers for individual horizontal runs 100 feet or longer.
- C. Install hangers with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, this specification, and authorities having jurisdiction requirements, whichever are most stringent. Install hangers for horizontal piping with the following maximum spacing and minimum rod diameters:

<u>Nom. Pipe Size - In.</u>	<u>Copper Tube Max. Span - Ft.</u>	<u>Min. Rod Dia. - In.</u>
Up to 1-1/4	6	3/8
1-1/2 to 2	10	3/8
2-1/2 to 4	10	3/8
5	10	1/2
6	10	1/2
8	10	1/2

- 1. Support vertical copper tube at each floor and in intervals not to exceed 10 feet.
- D. Support water piping within 12" of each elbow or tee and for water piping 2-1/2" and larger at each valve or strainer.
- E. Support water piping above the floor with pipe supports attached to the floor with anchor bolts where indicated on the drawings. Conform to the table above for maximum spacing of supports.
- F. Provide vibration isolation for piping connected to rotating equipment. Vibration isolators are specified in Division 22 specification Section "Vibration Isolation for Plumbing Piping and Equipment".

3.07 PIPE AND TUBE JOINT CONSTRUCTION

- A. Soldered Joints: Comply with the procedures contained in the AWS "Soldering Manual."

- B. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
 - 1. CAUTION: Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering and brazing.
 - 2. Fill the tubing and fittings during brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.
 - 3. Heat joints to proper and uniform temperature.
- C. Threaded Joints: Conform to ASME B1.20.1, tapered pipe threads for field-cut threads. Join pipe fittings and valves as follows:
 - 1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - 2. Align threads at point of assembly.
 - 3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
 - 4. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.
 - a) Damaged Threads: Do not use pipe with corroded or damaged threads. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.
- D. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.
- E. Joints Containing Dissimilar Metals: Provide dielectric unions for 2" and smaller and dielectric flanges for piping 2-1/2" and larger. Provide dielectric waterway fittings for 2" and smaller in concealed locations. Dielectric unions, waterway fittings and flanges are specified in Section "Basic Piping Materials and Methods".
- F. Joints at Valve Assemblies or Connections to Equipment: Provide unions downstream of shutoff valves at valve assemblies or equipment connections. Unions are not required at flanged connections. Unions are specified in Division 22 section "Basic Piping Materials and Methods".

3.08 SERVICE ENTRANCE

- A. Extend water distribution piping to connect to water service piping, of size and in location indicated for service entrance to building. Water service piping is specified in a separate section of Division 2.
- B. Underground exterior water distribution piping to be a depth as required by local conditions, in accordance with authority having jurisdiction's requirements and at depth no less than 18" below grade.

- C. Install sleeve and mechanical sleeve seal at penetrations through foundation wall for watertight installation.
- D. Install sleeve and caulk at penetrations through building floor for watertight installation.
- E. Install shutoff valve at service entrance inside building; complete with strainer, pressure gauge, and test tee with valve.
- F. Ductile-Iron Pipe: Install in accordance with AWWA C-600. Pipe below ground inside building and to a point 5 feet outside of building shall have restrained joints.

3.09 VALVE APPLICATIONS

- A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shut-off duty: Use ball and butterfly valves.

3.010 INSTALLATION OF VALVES

- A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated. For sectional valves 2 inches and smaller, use ball valves; for sectional valves 2-1/2 inches and larger, use ball or butterfly valves.
- B. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, on each supply to each plumbing fixture, and elsewhere as indicated. For shutoff valves 2 inches and smaller, use ball valves; for shutoff valves 2-1/2 inches and larger, use ball or butterfly valves.
- C. Drain Valves: Install drain valves on each plumbing equipment item, located to drain equipment completely for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to drain distribution piping system completely. For drain valves 2 inches and smaller, use ball valves; for drain valves 2-1/2 inches and larger, use ball butterfly valves.
- D. Check Valves: Install swing check valves on discharge side of each pump and elsewhere as indicated.
- E. Hose Bibbs: Install on exposed piping where indicated with vacuum breaker.
- F. Wall Hydrants: Install where indicated with vacuum breaker.
- G. Emergency Mixing Valves: Install where indicated on the plans with hot and cold water branch lines connecting to the mains without any shutoff valves. No other fixtures shall connect to the branch lines feeding the emergency mixing valve. Install ball valves with locking handles at the emergency mixing valve as indicated on the plans.

- H. Point-of-Use Thermostatic Mixing Valve: Install valve complying with ASSE 1070 on all public lavatories and handwashing sink locations. Install valve to be accessible by maintenance staff. Set temperature limit to 110F for dual temperature faucet or 100F for single temperature faucet.”

3.011 INSTALLATION OF FLOW CONTROL VALVES

- A. Install automatic flow control valves in each hot water recirculating loop, and elsewhere as indicated. Install a shutoff valve and strainer upstream and a union, check valve and shutoff valve downstream of each flow control or automatic flow control valve.
- B. Set flow control valve flow rate as follows:
 - 1. Preliminary Procedures For Hot Water Return System Balancing:
 - a) Before operating the system perform these steps:
 - 1) Open valves at recirculation pump and flow control valves to full open position.
 - 2) Remove and clean all strainers.
 - 3) Check recirculation pump rotation.
 - 4) Set water heater temperature as indicated on the drawings.
- C. Reports: Prepare hot water return system balancing reports signed and submit to the Architect upon completion of the project. Include the following information:
 - a) Valve tag number and description of location
 - b) Valve body size
 - c) Differential pressure reading from instrument in psi
 - d) Actual flow rate derived from the manufacturer’s charts and tables for the valve size and measured differential pressure.

3.012 INSTALLATION OF PIPING SPECIALTIES

- A. Install backflow preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air gap fitting and pipe relief outlet drain without valves to nearest floor drain.
- B. Install pressure reducing valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gauge on valve outlet.

3.013 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by plumbing code.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and union for each

connection; provide drain valve on drain connection. For connections 2-1/2 inches and larger, use flanges instead of unions.

3.014 FIELD QUALITY CONTROL

- A. Inspections: Inspect water distribution piping as follows:
1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
 2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
 - a) Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed in after system is roughed in and prior to setting fixtures.
 - b) Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
 - c) Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
 - d) Reports: Prepare inspection reports signed by the plumbing official and turn over to the Architect upon completion of the project.
- B. Piping System Test: Test water distribution systems in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:
1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.
 3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 5. Reports: Prepare inspection reports and required corrective action signed by the plumbing official and turn over to the Architect upon completion of the project.

3.015 ADJUSTING AND CLEANING

- A. Clean and disinfect water distribution piping as follows:
 - 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
 - 2. Use the purging and disinfecting procedure proscribed by the authority having jurisdiction or, in case a method is not proscribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:
 - a) Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
 - b) Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
 - c) Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
 - d) Following the allowed standing time, flush the system with clean, potable water until chlorine residual is lowered to incoming city water level.
 - e) Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.
 - 3. Reports: Prepare disinfection reports signed by the authority having jurisdiction and turn over to the Architect upon completion of the project.

3.016 COMMISSIONING

- A. Fill the system. Check compression tanks to determine that they are not air bound and that the system is completely full of water.
- B. Before operating the system, perform these steps:
 - 1. Close drain valve, hydrants, and hose bibbs.
 - 2. Open valves to full open position.
 - 3. Remove and clean strainers.
 - 4. Check pumps for proper direction of rotation. Correct improper wiring.
 - 5. Lubricate pump motors and bearings.

END OF SECTION