

# CHAPTER 6

## WATER SUPPLY AND DISTRIBUTION

### 601 GENERAL

#### 601.1 Scope

The provisions of this chapter shall govern the materials, design, construction, and installation of water supply and distribution systems.



#### 601.8 Disinfection of Potable Water System

The plumbing official may require that a potable water system or any part thereof installed or repaired be disinfected in accordance with one of the following methods before it is placed in operation:

1. The system, or part thereof, shall be filled with a solution containing 50 ppm of available chlorine and allowed to stand 6 hours before flushing and returning to service.
2. The system, or part thereof, shall be filled with a solution containing 100 ppm of available chlorine and allowed to stand 2 hours before flushing and returning to service.
3. In the case of a potable water storage tank where it is not possible to as provided in (1.) or (2.), the entire interior of the tank shall be swabbed with a solution containing 200 ppm of available chlorine and the solution allowed to stand 2 hours before flushing and returning to service.
4. In the case of potable water filters or similar devices, the dosage shall be determined by the plumbing official.

#### 601.9 Allowance for Character of Water

**601.9.1 Selection of Materials.** When selecting the material and size for water supply pipe, tubing, or fittings, due consideration shall be given to the action of the water on the interior and of the soil, fill or other material on the exterior of the pipe. No material that would produce toxic conditions in a potable water supply system shall be used for piping, tubing or fittings.

**601.9.2 Used Piping.** A piping material that has been used for other than a potable water supply system shall not be reused in the potable water supply system.

#### 601.10 Hot Water Distribution

The hot water supply to any fixture requiring hot water shall be installed on the left side of the fixture unless otherwise specified by the manufacturer.

#### 601.11 Tests

The water supply and distribution system shall be tested in accordance with 311.3.

#### 601.12 Water Supply Mandatory

Every building used for human occupancy or habitation in which plumbing fixtures are installed shall be provided with an ample supply of potable water.

### 602 DEFINITIONS

The following definitions have been moved to Chapter 2: AIR GAP (WATER DISTRIBUTION), CRITICAL LEVEL, CROSS CONNECTION, EFFECTIVE OPENING, NON POTABLE WATER, WATER SUPPLY SYSTEM.

### 603 MATERIALS

Water service pipe and fittings shall be of materials specified in 608. Water distribution pipe, tubing and fittings shall be of materials specified in 611. Materials shall comply with the standards listed in Table 603.

**Table 603**  
**Water Pipe and Fitting Materials**

MATERIALS	STANDARDS
<b>PLASTIC WATER PIPE &amp; FITTINGS</b> ABS and PVC Plastic Tubular Fittings	ASTM F 409, ANSI/NSF 24, ANSI/NSF 14
Joints for IPS PVC Pipe Using Solvent Cement	ASTM D 2672
Chlorinated poly(vinyl chloride) (CPVC) plastic pipe, Schedule 80, 2" and under	ASTM F 441, Listed
Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)	ASTM F 442
CPVC Pipe & Fittings	ASTM D 2846, Listed
Cross-linked Polyethylene/Aluminum/ Cross-linked Polyethylene (PEX-AL-PEX) pressure pipe and fittings	ASTM F 1281
Cross-linked Polyethylene (PEX) Plastic Hot-and Cold-Water Distribution System	ASTM F 877, Listed
Cross-linked Polyethylene (PEX) Tubing	ASTM F 876
Cross-linked Polyethylene (PEX) Tubing Systems for Pressure	CAN/CSA-B137.5-M89, Listed
Flexible Elastomeric Pressure Joints	ASTM 03139, See 308.8
Metal Insert Fittings for PB Tubing	ASTM F 1380
Polyethylene/Aluminum/Polyethylene (PE-AL-PE) pressure pipe and fittings	ASTM F 1282
Polyethylene Pipe & Tubing (PE) Number 2305, 2306, 3306, 3406, 3408	ASTM D 2104, ASTM D 2239, ASTM D 2737, Listed, See 303.8.2
Poly (vinyl chloride) (PVC) plastic pipe fittings, schedule 40	ASTM D 2466
Pressure Rated ABS-Fittings	ASTM D 2468, Listed
Pressure Rated ABS-Pipe Number 1210, 2112, 1316	ASTM D 1527, ASTM D 2282, Listed, See 303.8.2
PVC Injection Molded Gasketed Fittings for Pressure Applications	CAN/CSA-B137.2-M89, Listed
PVC Pipe, Number 1120, 1220	ASTM D 1785, ASTM D 2241, Listed, See 303.8.2
PVC Socket-Type Fittings, Schedule 80	ASTM D 2467, Listed
Socket-type chlorinated poly(vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under	ASTM F 439, Listed
Threaded chlorinated poly(vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under	ASTM F 437, Listed
<b>FERROUS WATER PIPE &amp; FITTINGS</b> Cast Iron Fittings (Threaded)	ASTM A 126
Cast Iron Pipe (Threaded)	ANSI A40.5
Cast Iron Water Pipe	ASTM A 377
Ductile-iron water pipe	ANSI/AWWA C151/A 21.51
Ductile-iron water fittings	ANSI/AWWA C110/A 21.10
Malleable Iron Fittings (Threaded)	ASTM A 197
Nipples Pipe (Threaded)	FS WW-N-351a
Stainless Steel Water Pipe Grade H	ASTM A 268, See 303.8.4
Steel couplings, threaded, black and galvanized	ASTM A 865
Steel Pipe Black and Galvanized	ASTM A 53
Welded and Seamless Steel Pipe	ASTM A 53

(continued)

**Table 603 (continued)**  
**Water Pipe and Fitting Materials**

MATERIALS	STANDARDS
<b>NONFERROUS PIPE &amp; FITTINGS</b> Cast Bronze Fittings for Flared Copper Tube	ANSI B16.26
Cast Bronze Threaded Fittings	ASME B16.15
Cast Bronze Solder-Joint Pressure Fittings	ANSI B16.18
Cast Copper Alloy Fittings for Flared Copper Tubes	ASME B16.26
Pipe Flanges & Flanged Fittings	ANSI B16.5
Seamless Brass Tube	ASTM B 135
Seamless Copper Pipe	ASTM B 42
Seamless Copper Tube	ASTM B 75
Seamless Copper Water Tube Types K, L & M	ASTM B 88
Seamless Red Brass Pipe	ASTM B 43
Seamless and Welded Copper Distribution Tube (Type D)	ASTM B 641
Threadless Copper Pipe (TP)	ASTM B 302
Welded Brass Tube	ASTM B 587
Welded Copper Tube	ASTM B 447
Welded Copper Alloy UNS No C 21000 Water Tube	ASTM B 642
Wrought-Copper and Copper Alloy Solder-Joint Pressure Fittings	ASME B16.22, For Copper Water Tube
Wrought Seamless Copper and rectangular Copper-Alloy Pipe and Tube	ASTM B 251, Square and tubing not applicable
Valves-Flanged Threaded, and Welding End	ANSI B16.34

## 604 QUALITY OF WATER SUPPLY

### 604.1 Potable Water

Potable water shall be used for drinking, culinary, and domestic purposes.

### 604.2 Acceptable Sources

Where a public supply of potable water is not available, requirements satisfactory to the governing authority shall be observed.

### 604.3 Nonpotable Water

Nonpotable water shall not be supplied to any fixture customarily classified a plumbing fixture and may only be used to supply industrial equipment or other appliances which do not require a potable supply of water and provided such nonpotable water shall not be accessible for drinking, culinary or bathing purposes.

## 605 COLOR CODE IDENTIFICATION

### 605.1 Color Coding

Piping and outlets conveying nonpotable water shall be adequately and durably identified by a distinctive yellow-colored paint so that it is readily distinguished from piping carrying potable water. See ASME A 13.1.

### 605.2 Nonpotable Water

Where nonpotable water is used, all valves, branch fittings and branch terminals shall be identified by the words "nonpotable water." This identification shall be done in accordance with ASME A 13.1. Such identification shall not be concealed by pipe insulation and when insulated the

insulation shall be painted the same color as is required for the pipe. Maintenance of all identification shall be the responsibility of the owner.

## 606 PROTECTION OF POTABLE WATER SUPPLY

### 606.1 Backflow and Back-Siphonage

**606.1.1 Backflow.** The water distribution system shall be protected against backflow. Every water outlet shall be protected from backflow, preferably by having the outlet end from which the water flows spaced a distance above the flood level rim of the receptacle into which the water flows sufficient to provide a "minimum required air gap" as defined in ASME A 112.1.2. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessible backflow preventer complying with 606.2.

**606.1.2 Back-Siphonage.** Potable water supply piping, water discharge outlets, backflow prevention devices or similar equipment shall not be so located as to make possible their submergence in any contaminated or polluted liquid or substance.

### 606.2 Approval of Devices

Devices for the prevention of backflow or back-siphoning shall comply with the standards listed in Table 606. Devices installed in a potable water supply for protection against backflow shall be maintained in good working condition by the person or persons having control of such devices. The plumbing official may inspect such devices and, if they are found to be defective or inoperative, shall require the replacement thereof.

**Table 606**  
**Backflow Prevention Devices**

MATERIALS	STANDARDS
Air Gap Standards	ASMEA112.1.2
Backflow Preventers, Double Check Valve Assembly	ASSE 1015, ANSI/AWWA C510
Backflow Preventers with Intermediate Atmospheric Vent	ANSI/ASSE 1012
Backflow Preventers, Double Check Detector Assembly	ANSI/ASSE 1048
Backflow Preventers, Hose Connection	ANSI/ASSE 1052
Backflow Preventers, Reduced Pressure Detector Assembly	ANSI/ASSE 1047
Backflow Preventers, Reduced Pressure Principle Assembly	ASSE 1013, ANSI/AWWA C511
Dual Check Valve Type Backflow Preventer	ASSE 1032, For carbonated beverage dispensers- post mix type
Field Test Procedures for Backflow Preventer Assemblies	ASSE 5010
Manual for the Selection, Installation, Maintenance and Field Testing of Backflow Prevention Devices	CAN/CSA-B64.10
Vacuum Breakers, Anti-Siphon, Pressure Type Assembly (Outdoor Use)	ASSE 1020
Vacuum Breakers-Atmospheric Pipe Applied	ANSI/ASSE 1001
Vacuum Breakers, Back Siphonage, Pressure Type Assembly (Spill Resistant)	ANSI/ASSE 1056
Vacuum Breakers, Hose Connection Vacuum	ANSI/ASSE 1011
Breakers, Laboratory Faucet	ANSI/ASSE 1035
Vacuum Breaker Wall Hydrants, Frost Resistant	ASSE 1019
Automatic Draining	ASSE 1002
Water Closet Flush Tank Fill Valves (Ballcocks)	

### 606.3 Where Required

**606.3.1 Flushometer.** Flushometer valves shall be equipped with an approved vacuum breaker. The vacuum breaker shall be installed on the discharge side of the flushing valve with the critical level at least 4 inches (102 mm) above the overflow rim of the bowl. Flushometer tanks shall be provided with an approved backflow prevention device installed above the flood level rim of the fixture.

**606.3.2 Flush Tanks.** Flush tanks shall be equipped with an approved ballcock. The ballcock shall be installed with the critical level of the vacuum breaker at least 1 inch (25.4 mm) above the full opening of the overflow pipe. In cases where the ballcock has no hush tube, the bottom of the water supply inlet shall be installed at least 1 inch (25.4 mm) above the full opening of the overflow pipe. A sheathed ballcock shall be installed on all gravity flush tanks in which the flush valve seat is less than one inch (25.4 mm) above the flood level rim of the bowl.

**606.3.3 Lawn Sprinklers and Irrigation Piping System.** Lawn sprinkler systems and irrigation piping systems shall be equipped with an approved backflow preventer to protect against contamination of the potable water system. The following devices shall be acceptable:

1. Anti-siphon vacuum breakers, reduced pressure zone backflow preventer and pressure type vacuum breakers equipped with gate or ball valves and test cocks. (See Appendix D of the Louisiana State Plumbing Code for acceptable types based upon the application.)
2. Atmospheric type vacuum breakers shall be installed downstream of the last control valve at least 6 inches (152 mm) above the level of the highest sprinkler head.
3. All protective devices shall be installed in an accessible location to allow for inspection and maintenance and to isolate the sprinkler system from all other piping in the system.
4. Pressure type vacuum breakers shall be installed at least 12 inches (305 mm) above the level of the highest sprinkler head.

### 606.3.4 Fixture Valve Outlets with Hose Attachments, Hose Bibbs and Lawn Hydrants.

**606.3.4.1** Fixture valve outlets with hose attachments, hose bibbs and lawn hydrants shall be protected against backflow by an air gap, a vacuum breaker or other approved back-siphonage backflow preventer on the discharge side of the valve. Back-siphonage backflow preventers may be installed directly on hose outlet connection threads. Vacuum breakers shall be installed at least 6 inches (152 mm) above the highest point of usage.

EXCEPTION: Water heater drains, boiler drains and washing machine connections shall not be required to be fitted with backflow prevention devices.

**606.3.4.2** In areas subject to temperatures of 32°F (0°C) or below, all hose bibb vacuum breakers shall be of such design that the hydrant may be drained without removing the backflow preventer from the hydrant. Regardless of area temperature, hose bibb vacuum breakers shall be designed and installed to prevent total removal from the hose bibb after installation in accordance with the provisions of this code and the manufacturer's instructions.

### **606.3.5 Water Supply to Steam and Hot Water Heating Boilers, Heat Exchangers, Chilled Water Systems, Etc.**

A backflow preventer device which will automatically vent to the atmosphere shall be installed in the water supply line to all steam and hot water space heating boilers, heat exchangers, chilled water systems and similar devices being supplied from the potable water system. Such devices shall prevent back-siphonage and backflow from the heating system into the potable supply lines should the supply pressure fall below the pressure in the heating system. Such devices shall meet the requirements of ASSE 1012 or 1013 and shall bear such identification as is required by the applicable standard. (See Appendix D of the Louisiana State Plumbing Code for acceptable types based upon the application.)

**606.3.6** Connections to automatic fire sprinkler systems shall be required to meet the minimum requirements as referenced in Appendix D of the Louisiana State Plumbing Code.

### **606.3.7 Pull-out Spout Type Faucets**

Pull-out spout type faucets shall be in compliance with CAN/CSA B125 or IAPMO PS 49 and have an integral vacuum breaker or vent to atmosphere in their design or shall require a dedicated deck or wall mounted vacuum breaker.

### **606.3.8 Portable Cleaning Equipment**

Where the portable cleaning equipment connects to the water distribution system, the water supply system shall be protected against backflow with an air gap, an atmospheric type vacuum breaker, a pressure type vacuum breaker or a reduced pressure principle backflow preventer. (See Appendix D of the Louisiana State Plumbing Code for acceptable types based upon the application.)

### **606.3.9 Chemical Dispensers**

Where chemical dispensers connect to the water distribution system, the water supply system shall be protected against backflow with an air gap, an atmospheric type vacuum breaker, a pressure type vacuum breaker or a reduced pressure principle backflow preventer. (See Appendix D of the Louisiana State Plumbing Code for acceptable types based upon the application.)

### **606.3.10 Dental Pump Equipment**

Where dental pumping equipment connects to the water distribution system, the water supply system shall be protected against backflow with an air gap, an atmospheric

type vacuum breaker, a pressure type vacuum breaker or a reduced pressure principle backflow preventer. (See Appendix D of the Louisiana State Plumbing Code for acceptable types based upon the application.)

## **606.4 Backflow Preventer Installation**

**606.4.1** Reduced pressure zone (RPZ) type backflow preventers, and other types of backflow preventers with atmospheric ports and/or test cocks, shall not be installed below grade (in vaults or pits) where the potential for a relief valve, an atmospheric port, or a test cock being submerged exists.

**606.4.2** Pipe applied atmospheric type vacuum breakers shall be installed not less than 6 inches above the flood level rim of the fixture receptor or device served. Pipe applied pressure type vacuum breakers shall be installed not less than 12 inches above the flood level rim of the fixture receptor or device served. Approved deck mounted vacuum breakers and vacuum breakers within equipment, machinery and fixtures, whether of the atmospheric or spill-proof pressure type, where the critical level is a fixed distance above the potential source of contamination, shall be installed not less than 1 inch (25.4 mm) above the flood level rim of the fixture receptor device served or source of contamination.

## **606.5 Shut-off Valves and Test Cocks Required**

All pressure type backflow preventers which are designed for periodic field testing after installation in the pipeline shall be equipped with shut-off valves on both the inlet and the outlet side of the backflow preventer. In addition, test cocks shall be provided and so located that test equipment, gauges, etc., may be connected to the device at such points that the pressure in each pressure zone may be detected and, in addition, a test cock shall be located upstream of the upstream shut-off valve or installed in a special tapping on the upstream side of the upstream shut-off valve. But, in any case, such test cock shall be accessibly located as close to the device as practical. Where applicable approved standards specify otherwise, the location of test cocks shall be as specified by the standard. Full port ball valve shut-offs on backflow prevention sizes to 2 inches or full port ball or resilient wedge-type shut-off valves for 2 1/2 inches and larger shall be used.

## **606.6 Reduced Pressure Zone Backflow Preventers**

Reduced pressure zone backflow applications subject to periodic no flow conditions should include a single soft seated spring loaded check valve located immediately upstream of the backflow prevention device to prevent periodic relief valve activation caused by fluctuating supply pressures.

## **606.7 Additional Requirements to Protect the Potable Water Supply**

See Appendix D, Cross Connection Control, of the Louisiana State Plumbing Code for additional requirements. For other rules and regulations regarding potable water supply protection, see Chapter XII (Water Supplies) of the State Sanitary Code of Louisiana.

## 607 SIZING OF WATER DISTRIBUTION SYSTEM

### 607.1 Minimum Sizes

The sizing of the water distribution system shall conform to good engineering practice (*e.g.*, see Appendix F). See 607.3 for minimum size of fixture supply line and 607.4 for minimum pressure at the fixture outlet.

### 607.2 Calculation of Sizes

When required by the plumbing official, the sizing of the water distribution system shall be calculated by a registered mechanical engineer or other acceptable authority.

### 607.3 Size of Fixture Supplies and Manifold Individual Distribution Lines

**607.3.1** The minimum size of fixture supply pipe or manifold individual distribution lines shall be in accordance with Table 607.

**Table 607 Minimum Size of Fixture Supply or Distribution Line**

Type of Fixture or Device	Fixture Supply Pipe Size (in.)	Manifold Individual Distribution Line Size (in.)
Bathbubs (60" x 32" and smaller)	1/2	1/2
Bathbubs (Larger than 60" x 32")	1/2	1/2
Combination Sink and Tray	1/2	1/2
Drinking Fountain	3/8	1/2
Dishwasher (Domestic)	1/2	1/2
Kitchen Sink, Residential	1/2	1/2
Kitchen Sink, Commercial	3/4	3/4
Lavatory	3/8	1/2
Laundry Tray 1, 2, or 3 Compartments	1/2	1/2 (1 Tray)
Wall Hydrants	1/2	1/2
Shower (Single Head)	1/2	1/2
Sinks (Service, Slop)	1/2	1/2
Sinks Flushing Rim	3/4	3/4
Urinal (Flush Tank)	1/2	1/2
Urinal (Direct Flush Valve)	3/4	3/4
Water Closet (Flushometer Valve Type)	1	1
Water Closet (Gravity or Flushometer Tank Type)	3/8	1/2
Hose Bibbs	1/2	1/2

1 in. = 25.4 mm

**607.3.2** For fixtures not listed, the minimum supply branch may be made the same as for a comparable fixture.

### 607.4 Minimum Pressure

Minimum fairly constant service pressure at the point of outlet discharge shall be not less than 8 psi (55.2 kPa) flowing for all fixtures except for direct flush valves, for which it shall be not less than 15 psi (103 kPa) flowing, and except where special equipment is used requiring higher pressure. In determining the minimum pressure, allowance

shall be made for the pressure drop due to friction loss in the piping system during maximum demand periods as well as head, meter, and other losses in the system.

### 607.5 Auxiliary Pressure, Supplementary Tanks

If the residual pressure in the system is below the minimum allowable at the highest water outlet when the flow in the system is at peak demand, an automatically controlled pressure tank or automatically controlled pump or gravity tank of sufficient capacity shall be installed. Its capacity shall be sufficient to supply sections of the building installation which are too high to be supplied directly from the public water main.

### 607.6 Low Pressure Cutoff

When a booster pump is used on an auxiliary pressure system, there shall be installed a low-pressure (< 15 psi gauge) cutoff on the booster pump to prevent the creation of negative pressures on the suction side of the water system. Other arrangements may be used if found adequate and if approved by the plumbing official.

### 607.7 Variable Street Pressures

When the street main has a wide fluctuation in pressure, the water distribution system shall be designed for minimum pressure available.

### 607.8 Hazard and Noise

**607.8.1** Where water pressures are excessive or where required to eliminate water hammer or when deemed necessary by local authorities, approved engineered water hammer arresters or calculated air chambers shall be provided to safeguard the water distribution system against destructive water hammer hazard and noise.

**607.8.2** Approved engineered mechanical water hammer arresters shall be sized and installed in accordance with PDI-WH201, ANSI/ASSE 1010 or ANSI A112.26.1M. Where line water pressure exceeds 65 psi (448 kPa) in a water distribution system, the next larger size approved water hammer arrester shall be used. When water pressure exceeds 80 psi (552 kPa), a water pressure reducing valve shall be installed in accordance with 607.9. Any approved engineered mechanical water hammer arrester shall have been tested by a recognized testing laboratory and certified to meet the requirements of the above standard.

**607.8.3** Where calculated air chambers are installed, they shall be in an accessible place and each air chamber shall be provided with an accessible means for restoring the air in the event the chamber becomes waterlogged.

### 607.9 Water Pressure Reducing Valve or Regulators

**607.9.1** Where water pressure within a building exceeds 80 psi (552 kPa) static, an approved water pressure regulator conforming to ANSI/ASSE 1003 with strainer shall be installed to reduce the pressure in the building water distribution piping to 80 psi (552 kPa) static or less, whichever is consistent with good engineering practice. Exceptions to this requirement are service lines to sill

cocks and outside hydrants, and main supply risers in tall buildings where pressure from the mains is reduced to 80 psi (552 kPa) or less at the fixture branches or at individual fixtures.

**607.9.2** The delivery pressure variation shall not exceed 1 psi (6.895 kPa) for every 10 psi (69 kPa) pressure change in the inlet pressure. The reduced pressure fall-off from its no-flow setting shall not exceed 17 psi (117 kPa), and with a difference at this point of 50 psi (345 kPa) between the initial and this reduced flow pressure of 50 psi (345 kPa), the capacity shall be not less than that shown in Table 607.9.

**Table 607.9  
Minimum Capacity Based on Pipe Size**

Nom. Pipe Size (in)	1/2	3/4	1	1 1/4	1 1/2	2
Average velocity through pipe (ft/s)	10.5 Flow	10.0	9.5	9.0	8.5	7.5
(gpm)	9.95	16.65	25.0	42.0	54.8	77.5

1 in = 25.4 mm  
1 ft/s = 0.3048 m/s  
1 gpm = 0.0631 Us

★ **607.9.4** An integral bypass check valve shall be capable of opening to permit a reverse flow of water through the reducing valve to prevent a buildup of system pressure by thermal expansion of the water with an increase of reduced pressure not exceeding 2 psi (13.8 kPa) above the prevailing initial pressure.

**607.9.5** The valve shall be designed to remain open to permit uninterrupted water flow in case of valve failure.

**607.9.6** All regulators and strainers must be so constructed and installed as to permit repair or removal of parts without breaking a pipeline or removing the valve and strainer from the pipeline.

**607.9.7** Approved valves shall comply with ANSI/ASSE 1003.

**607.10 Manifold Water Distribution Systems**

**607.10.1** Hot water and cold water manifolds shall be sized according to Table 607.10.

**Table 607.10 Maximum Gallons Per Minute (GPM) Available<sup>2</sup>**

Nominal Size ID (Inches)	Velocity <sup>1</sup>	
	4 fps	8 fps
1/2	2	5
3/4	6	11
1	10	20
1 1/4	15	31
1 1/2	22	44

1 in = 25.4 mm  
1 fps = 0.3048 m/s  
1 gpm = 0.0631 Us

**Notes:**

1. For velocity limitations use manufacturers' recommendations.
2. Total gpm is the demand of all outlets.

**607.10.2** Individual distribution line size shall conform to Table 607 or to good engineering practice (e.g., see Appendix F).

**607.10.3** Individual fixture shutoff valves shall be installed at the outlet for each fixture. If secondary shutoff valves are used at the manifold, they shall be identified for the fixture being supplied.

**607.10.4** Piping bundles for manifold systems shall be supported in accordance with Chapter 3. Direction changes and bending radiuses shall be in accordance with manufacturer's recommendations.

**608 WATER SERVICE PIPE AND FITTINGS**

**608.1.1 Materials Underground**

Materials for underground water service pipe and lawn sprinkler systems, shall be a minimum Type L copper tube, brass, cast iron pressure pipe, ductile-iron, or pressure-rated plastic as listed in Table 603. Water pipe and fittings with more than 8.0% lead shall not be used. The minimum working pressure of plastic piping installed outside of the foundation walls shall be 160 psi (1103 kPa) at 73°F (23° C), with permanent identification markings.

**608.1.2** Materials subject to corrosion shall be protected when installed in corrosive soils. Approved fittings shall be used on the water supply system, except that changes of direction in copper tube (ASTM B 88) may be made with bends having a radius of not less than four diameters of the tube, providing that such bends are made by use of forming equipment which does not deform or create loss in cross-sectional area of the tube. If allowed by the manufacturer, bends of pressure-rated plastic pipe listed in Table 603 shall be installed to conform with the manufacturer's recommendations but in no case shall the bend radius be less than the requirements contained within Sections 611.1.4 through 611.1.7, as applicable.

**608.1.3** All pipes, pipe fittings, solder and flux used in the installation of water supply systems shall be lead free.

**Exception:** Leaded joints may be used for the repair of existing cast iron pipes.

### 608.2 Water Service Piping

Water service lines shall be sized in accordance with accepted engineering practice (e.g., see Appendix F), but in no case shall the water service piping be less than one inch inside nominal diameter for galvanized ferrous piping or 3/4 inch inside diameter for copper, copper alloy or approved noncorrosive pipe or tube.

### 608.3 Service Lines Near Drain or Sewer Line

Except as permitted in 608.4, the underground water service pipe and the building drain or building sewer shall be not less than 5 ft (1524 mm) apart horizontally and shall be separated by undisturbed or compacted earth.

### 608.4 Permitted Installation Near Drain or Sewer Line

The water service pipe may be placed in the same trench with the building drain and building sewer provided the following conditions are met:

1. The bottom of the water service pipe, at all points, shall be at least 12 inches (305 mm) above the top of the sewer line at its highest point.
2. The water service pipe shall be placed on a solid shelf excavated at one side of the common trench.
3. Any underground water service pipe which must cross a pipe that conveys sewage (e.g., building drains, building sewers, and other piping conveying sewage) shall have a minimum vertical separation of 12 inches (305 mm) between the outside of the water service pipe and the outside of the sewer pipe. The water service pipe should always be installed above the sewer pipe. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer pipe as possible.

### 608.5 Stop and Waste Valves and Devices

Combination stop and waste valves and cocks shall not be installed underground in a water supply system. Any fixture or device which incorporates a stop and waste feature is prohibited if the waste opening is underground or in any location that waste water or water-borne contaminants may enter the device or water supply from the ground or other source by reversal of flow.

### 608.6 Private Water Supply

No private supply shall be interconnected with any public water supply.

### 608.7 Potable Water (Pressure) Lines Near Soil Absorption Trenches, Sand Filter Beds and Oxidation Ponds

Underground potable water (pressure) lines shall not be located within 25 feet (7.6 m) of any soil absorption trenches, sand filter beds, or oxidation ponds which have been installed for the disposal of septic tank effluent.

### 608.8 Potable Water (Pressure) Lines Near Septic Tanks, Mechanical Sewage Treatment Plants, and Pump Stations

Underground potable water (pressure) lines shall not be located within 10 feet (3.0 m) of any septic tank, mechanical sewage treatment plant, or sewage pump station.

### 608.9 Potable Water (Pressure) Lines Near Seepage Pit, Cesspool, or Sanitary Pit Privy

Underground potable water (pressure) lines shall not be located within 50 feet (15.2m) of any seepage pit, cesspool, or sanitary pit privy.

## 609 WATER PUMPING AND STORAGE EQUIPMENT

### 609.1 Pumps and Other Appliances

Water pumps, tanks, filters, softeners, and all other appliances and devices shall be protected against contamination.

### 609.2 Drains from Pressure Tanks, Boilers, and Relief Valves

The drains from pressure tanks, boilers, relief valves and similar equipment shall not be directly connected to the drainage system.

### 609.3 Cleaning, Painting, Repairing Water Tanks

A potable water supply tank shall not be lined, painted, or repaired with any material which will affect either the taste or the potability of the water supply when the tank is returned to service. Tanks shall be disconnected from the system during such operations, to prevent any foreign fluid or substance from entering the distribution piping.

### 609.4 Insufficient Pressure

When the water pressure from the water main (or other approved sources of potable water supply) during flow is insufficient to supply all fixtures freely and continuously, the rate of supply shall be supplemented by a gravity house tank or booster system, (see 607.6)

### 609.5 Support

All water supply tanks shall be supported in accordance with the Standard Building Code or other regulations which apply.

### 609.6 Overflow Pipes

Overflow pipes for gravity tanks shall be protected against the entrance of insects and vermin and shall discharge above and within 6 inches (152 mm) of a roof or catch basin. Overflow pipes shall not be valved.

### 609.7 Drains

**609.7.1** Water supply tanks shall be provided with the valved drain lines located at their lowest point and discharged as an indirect waste. Drains for water supply tanks shall be not less than shown in Table 609.7.

**Table 609.7**  
**Minimum Drain Size for Water Supply Tanks**

Drain Pipe (in)	Tank Capacity (gal)	Drain Pipe (in)	Tank Capacity (gal)
1	Up to 750	2 1/2	3001 to 5000
1 1/2	751 to 1500	3	5001 to 7500
2	1501 to 3000	4	Over 7500

1 in = 25.4 mm  
1 gal = 3.7854 L

**609.7.2** Each drain line shall be equipped with a quick opening valve of the same diameter as the pipe.

### **609.8 Gravity and Suction Tank**

Tanks used for potable water supply shall be equipped with tight covers which are vermin and rodent proof. Such tanks shall be vented with a return bend vent pipe having an area not less than one-half the area of the feed riser, and the vent opening shall be properly screened.

### **609.9 Pressure Tank**

Pressure tanks used for supplying potable water shall be equipped with an approved vacuum relief device located on the top of the tank. The air inlet of this device shall be properly screened.

## **610 WATER SUPPLY CONTROL**

### **610.1 Valves Required**

An accessible shutoff valve shall be provided on the consumer's premises ahead of the first outlet or branch connection to the service or distribution pipe of each dwelling, dwelling unit and buildings other than dwellings and dwelling units. Full port ball valve shut-offs on lines to 2 inches or full port ball or resilient wedge-type shut-off valves for 2 1/2 inch lines and larger shall be used. When such shutoff valve is located in the service pipe outside the building, it shall be located and accessible in a manufactured, approved, valve box with a readily removable access cover which extends to grade level. When drain valves are provided for the distribution piping or other portion of the water supply system, such drains shall be above grade or otherwise located to prevent the possibility of backflow into the piping system after the system has been drained.

### **610.2 Tank Controls**

Supply lines taken from pressure or gravity tanks shall be valved at or near the tank.

### **610.3 Controls for Fixtures Within Dwellings and Dwelling Units**

**610.3.1** Each individual fixture shall have an accessible shutoff valve at each outlet which will permit each fixture to be shut off without interfering with the water supply to any other fixtures. Shutoff valves for each fixture supplied by a manifold distribution system may be located at the manifold in addition to the outlet of the fixture being supplied. The hose bibb or hose connection shutoff valve shall be the only shutoff valve required on washing machine connectors.

**610.3.2** Shutoff valves to water supply for refrigerators with automatic ice makers shall be accessible on the same floor.

### **610.4 Buildings Other Than Dwellings or Dwelling Units**

**610.4.1** In all buildings other than dwellings and dwelling units, shutoff valves shall be installed which permit the water supply to all fixtures and equipment in each separate room to be shut off without interference with the water

supply to any other room or portion of the building or each individual fixture and piece of equipment shall have a shutoff valve which will permit each fixture and piece of equipment to be shut off without interfering with the water supply to other fixtures or equipment.

**610.4.2** Each water supply branch line 1 1/2 inch or larger shall have a shutoff valve installed so as to isolate all fixtures and all pieces of equipment supplied by the branch line. The shutoff valve shall be installed in a labeled and accessible location as close to the connection to the supply main and/or riser as practical.

## **611 WATER DISTRIBUTION PIPE, TUBING AND FITTINGS**

### **611.1 General**

**611.1.1** Minimum working pressure for plastic hot and cold piping material shall be 100 psi (689.5 kPa) at 180°F (82°C).

**611.1.2** All pipes, pipe fittings, solder and flux used in the installation of water distribution systems shall be lead free.

EXCEPTION: Leaded joints may be used for the repair of existing cast iron pipes.

**611.1.3** All pipes, pipe fittings, solder and flux shall conform to the standards listed in Table 603.

**611.1.4** Bends of cross-linked polyethylene (PEX) plastic tubing shall be installed to conform to the manufacturer's recommendations but in no case shall the bend radius be less than the following:

1. When bent with the coil-a bending radius equivalent to or greater than 8 times the outside diameter of the tubing shall be maintained. Outside diameter is equal to the inside nominal diameter plus 1/8 inch.
2. When bent against the coil-a bending radius equivalent to or greater than 24 times the outside diameter of the tubing shall be maintained. Outside diameter is equal to the inside nominal diameter plus 1/8 inch.

**611.1.5** Because the linear expansion rate for cross-linked polyethylene (PEX) tubing is about 1 inch/10°F for each 100 feet (30 m) of tubing, it should not be rigidly anchored to any support in order to allow for freedom of movement during expansion and contraction. When installing long runs of tubing, a longitudinal clearance of 1/8 to 3/16 inch per foot of run should be allowed to accommodate for thermal expansion. PEX tubing, where it passes through concrete or a similar building material which would not allow for freedom of linear expansion, shall be provided with a pipe sleeve of schedule 40 pipe which shall be built into the foundation, footing, floor, wall or ceiling. Such pipe sleeve shall be of sufficient inside diameter to allow for the free expansion and contraction of the PEX tubing and to prevent any rubbing action.



## 612 JOINTS

**611.1.6** The maximum recommended spacing between horizontal supports for cross-linked polyethylene (PEX) tubing is 32 inches (813 mm) for nominal tubing diameters from 1/4 inch through 2 inch. It should not be rigidly secured to a joist or stud but should be secured with smooth plastic strap hangers, which permit ease of movement during expansion or contraction. Valve and fixture connections to which PEX pipe is connected shall be rigidly anchored.

**611.1.7** Bends of chlorinated polyvinyl chloride (CPVC) plastic pipe shall be installed to conform to the manufacturer's recommendations but in no case shall the bend radius be less than the following:

1. A bending radius equivalent to or greater than 18 inches (457 mm) for 1/2 and 3/4 inch inside nominal diameter piping.
2. A bending radius equivalent to or greater than 24 inches (610 mm) for 1 inch inside nominal diameter piping.

### 611.2 Materials Above Ground

Materials for water distribution pipes and tubing shall be brass, copper water tube minimum type L, stainless steel water tube minimum Grade H, cast iron pressure pipe, ductile-iron, galvanized steel, chlorinated polyvinyl chloride (CPVC) or cross-linked polyethylene (PEX) plastic pipe or tubing, all to be installed with approved fittings; except that changes in direction in copper tube (ASTM B 88) may be made with bends having a radius of not less than four diameters of the tube, providing that such bends are made by use of forming equipment which does not deform or create a loss in cross-sectional area of the tube. Translucent PEX plastic pipe or tubing, when installed above ground, shall not be exposed to direct or indirect sunlight.

### 611.3 Materials Below Ground

Inaccessible water distribution piping under slabs shall be copper water tube minimum type L, brass, cast iron pressure pipe, ductile-iron pipe, chlorinated polyvinyl chloride (CPVC) or cross-linked polyethylene (PEX) plastic pipe or tubing, all to be installed with approved fittings or bends. All copper tubing joints below a building slab shall be brazed. Joints for plastic pipe and fittings below a building slab are prohibited. Any material subject to corrosion shall be protected when used in corrosive soils.

### 611.4 Valves

Valves shall conform to the standards listed in Table 611.4

**Table 611.4**  
**Valve Standards**

MATERIALS	STANDARDS
Valves, Bronze Gate	MSS SP-80
Valves, Cast Iron Gate	ASTMA 126
Valves, Ball	MSS SP-72. MSS SP-110
Valves, Resilient-Seated Gate	ANSI/AWWA C509

### 612.1 General

This section contains provisions applicable to joints specifically for water service and distribution piping. Provisions for those joining methods which are applicable to more than one piping system are contained in Chapter 3.

### 612.2 Soldered Joints

Soldered joints for tubing shall be made with approved fittings. Surfaces to be soldered shall be cleaned bright, all burrs shall be removed and the tubing shall be returned to full bore. The joints shall be properly fluxed and made with approved solder (See 303.7.1, item 4 and 612.6). All solder and flux used in the installation or repair of water supply or distribution systems shall be lead free. Soldered joints should not be made closer than 18 inches (457 mm) to an installed plastic-to-metal adapter in the same water line.

### 612.3 Flared Joints

Flared joints for soft tempered copper water tube shall be made with fittings meeting approved standards. The tubing shall be expanded with a proper flaring tool.

### 612.4 Brazed Joints

Brazed joints shall be made in accordance with the provisions of Section 6 of ANSI B31.1. Brazed joints should not be made closer than 18 inches (457 mm) to an installed plastic-to-metal adapter in the same water line.

### 612.5 Joints for Plastic Water Service and Water Distribution Pipe and Fittings

**612.5.1 General.** Plastic pipe and fittings for water service piping and water distribution piping may be of the insert type, compression type, solvent cemented, heat fused, pressure-lock, or may be hot or cold flared as recommended by the manufacturer or the Plastic Pipe Institute for the particular materials being used. (See Table 303 for approved primers and solvent cements. Also, see 308.8.1.)

**612.5.2 Polyethylene Water Service.** Stiffener inserts used with compression type fittings shall not extend beyond the clamp or nut of the fitting. For bends, the installed radius of pipe curvature shall be not less than 30 pipe diameters, or the coil radius when bending with the coil. Coiled pipe shall not be bent beyond straight. Bends shall not be permitted closer than 10 pipe diameters of any fitting or valve. Kinked pipe shall not be used. Pipe shall be cut square, using a cutter designed for plastic pipe. Except where joined by heat fusion, pipe ends shall be chamfered to remove sharp edges. Heat fusion joints shall be made in accordance with ASTM D 2657 or ASTM F 1290. Flared joints shall be permitted where recommended by the manufacturer and made by the use of a tool designed for that operation.

**612.6 Copper Water Tube and Stainless Steel Water Tube**  
Joints for copper water tube or stainless steel water tube shall be formed either by the appropriate use of approved brass,

bronze or wrought copper water fittings, properly soldered or brazed together, or by means of approved flare fittings as provided in 612.3.

**612.7 Special Joints**

**612.7.1 Copper Water Tubing or Stainless Steel Tubing to Threaded Pipe Joints.** Joints from copper water tubing or stainless steel tubing to threaded pipe shall be formed by the use of bronze or copper adapter fittings. The joint between the copper tube or stainless steel tube and fittings shall be properly soldered or brazed, and the connection between the threaded pipe and the fitting shall be made with a standard pipe size threaded joint.

**612.7.2 Ground Joint Brass Connections.** Ground joint brass connections which allow adjustment of tubing but provide a rigid joint when made up shall not be considered as slip joints.

**612.7.3 Plastic Pipe to Other Materials.** Joints between plastic pipe and other materials shall be formed with proper adaption fittings as furnished by the manufacturer.

**612.7.4 Unions.** Unions in the water supply system shall be metal-to-metal with ground seats.

**613.2 Thermal Expansion Control**

**613.2.1** If water is heated and stored in a consumer's system and the system has been closed by the installation of a backflow preventer or a pressure reducing valve, a thermal expansion control shall be installed at an accessible location between the checking device and the water heating equipment to limit thermal expansion of the water being heated to not more than 80 pounds per square inch (552 kPa) static pressure at any fixture on the system. A potable water expansion tank or auxiliary relief valve set at 80 psi (552 kPa) shall be acceptable.

**613.2.2** The auxiliary relief valve shall be in addition to the water heater safety relief valve. This thermal expansion control device shall be designed and trimmed for repeated operation. The valve shall be a minimum 1/2 inch pipe size, shall be adjustable and calibrated, and shall include a tag describing its function.

**613.3 Non-Shower Mixing Valves**

Non-shower and non-shower/bath combination plumbing fixture fittings utilizing mixing valves and single control mixing valves, as defined under the ASSE 1029 standard, shall meet the requirements of ASSE 1029.

**614 MISCELLANEOUS**

**614.1 Drain Cock**

All storage tanks shall be equipped with adequate drain cocks.

**614.2 Line Valves**

Valves in the water supply distribution system, except those immediately controlling one fixture supply, when fully opened shall have a cross-sectional area at the smallest orifice or opening through which the water flows at least equal to the cross-sectional area of the nominal size of the pipe in which the valve is installed.

**614.3 Water Used for Processing**

Water used for cooling of equipment or similar purposes shall not be returned to the potable water distribution system. When discharged to the building drainage system or other point of disposal, the waste water shall be discharged through an air gap.

**614.4 Trap Primers**

**614.4.1** Trap primers which are connected directly to a potable water system shall conform to ASSE 1018. Trap primers which are connected directly to a potable water system shall be constructed with integral air gaps.

**614.4.2** Trap primers shall be accessible and shall not be concealed by building or other construction.

**614.4.3** Trap primer drains shall be constructed to completely drain by gravity after each cycle of operation and, in no case, shall the drain be connected to the trap below the top of the trap water seal or trap outlet weir.



**613 SAFETY DEVICES**

**613.1 Shower Temperature Control Devices**

The temperature of mixed water to multiple (gang) showers shall be controlled by a master thermostatic valve conforming to ASSE 1017 or such showers shall be individually controlled by a scald preventative valve of the pressure balancing, thermostatic or combination mixing valve type conforming to ASSE 1016. The temperature of mixed water to individual showers and shower/bath combinations in all buildings shall be controlled by a scald preventative valve of the pressure balancing, or thermostatic or combination mixing valve type conforming to ASSE 1016. All scald preventative valves shall be equipped with a means to limit the maximum setting of the valve to 120°F (48.3° C). Handle position stops or any other limit setting devices shall be adjusted in accordance with manufacturer's instructions at time of installation to a maximum mixed water outlet temperature of 120°F (48.3° C).

**Table 613 Temperature Control Device Standards**

MATERIALS	STANDARDS
Individual Shower Control Valves, Anti-Scald	ASSE 1016
Temperature Actuated Mixing Valves for Primary Domestic Use	ASSE 1017
Water Supply Valves: Mixing Valves and Single Control Mixing Valves	ASSE 1029

**614.4.4** Trap primer air gaps, when required, shall be located a minimum of 6 inches (152 mm) above the flood level of the floor drain or receptor served.

**614.4.5** Trap primers shall be connected to the cold water supply in accordance with the manufacturer's recommendations.

EXCEPTION: Source water may be a fixture drain for trap primers constructed in accord with Figure 14 of Appendix J.

**614.4.6** Separate cutoff valves shall not be installed between a trap primer and its water supply except that a cutoff valve for an individual fixture shall control both the water supply to the trap primer and the individual fixture to assure a constant supply to the primer.

## **615 WATER TREATMENT UNITS**

**615.1** Drinking water treatment units shall meet the requirements of ANSI/NSF 42 and 53. Units are designed to be used for the reduction of specific contaminants from potable drinking water, such contaminants being considered as potential health hazards or affecting the aesthetic quality characteristics of potable drinking water.

**615.2** Reverse osmosis drinking water treatment systems shall meet the requirements of ANSI/NSF 58. Systems are designed to be used for the reduction of specific contaminants from potable drinking water supplies considered to be microbiologically safe and of known quality (except that claims for the reduction of filterable cysts may be permitted). Systems covered by this standard are intended for reduction of total dissolved solids (TDS) and other contaminants specified therein.

**615.3** Waste and discharge from reverse osmosis or other types of water treatment units shall enter the drainage system through an air gap.

## **616 SOLAR ENERGY UTILIZATION**

Solar energy systems used for heating potable water or using an independent medium for heating potable water shall comply with the applicable requirements of this code. The use of solar energy shall not compromise the requirements for cross connection or protection of the potable water supply system required by this code. Solar energy systems shall also meet the applicable requirements of the Standard Building Code, Standard Gas Code, Standard Mechanical Code and the locally adopted energy code.

## **617 APPENDIX REFERENCES**

Additional provisions for water supply and distribution are found in the following appendices: Appendix B - Travel Trailers and Travel Trailer Parks; Appendix C - Mobile/Manufactured Homes and Mobile/Manufactured Home Parks; Appendix D - Cross-Connection Control; Appendix F -

Sizing of Water Piping System; and Appendix G - Medical Facilities Plumbing Systems. These provisions are applicable only when they are referenced in the body of the code sections or when included in the adopting ordinance.

