

## **4101:3-6-01 Water supply and distribution.**

*[Comment: When a reference is made within this rule to a federal statutory provision, an industry consensus standard, or any other technical publication, the specific date and title of the publication as well as the name and address of the promulgating agency are listed in rule 4101:3-13-01 of the Administrative Code. The application of the referenced standards shall be limited and as prescribed in section 102.5 of rule 4101:1-1-01 of the Administrative Code.]*

### **SECTION 601 GENERAL**

**601.1 Scope.** This chapter shall govern the materials, design and installation of water supply systems *within a building*, both hot and cold, for utilization in connection with human occupancy and habitation.

***Exceptions:***

- 1. This chapter shall not apply to private water systems as defined in section 3701.344 of the Revised Code and as defined in paragraph (ZZ) of rule 3701-28-01 of the Administrative Code and within the scope of the rules of the "Ohio Department of Health" .*
- 2. This chapter shall not apply to public water systems as defined in division (A) of section 6109.01 of the Revised Code and as defined in rule 3745-81-01 of the Administrative Code and within the scope of the rules of the "Ohio Environmental Protection Agency".*

**601.2 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.

**601.3 Existing piping used for grounding.** Existing metallic water service piping used for electrical grounding shall not be replaced with nonmetallic pipe or tubing until other approved means of grounding is provided.

**601.4 Tests.** The potable water distribution system shall be tested in accordance with Section 312.5.

### **SECTION 602 WATER REQUIRED**

**602.1 General.** Every structure equipped with plumbing fixtures and utilized for human occupancy or habitation shall be provided with a potable supply of water in the amounts and at the pressures specified in this chapter.

**602.2 Potable water required.** Only potable water shall be supplied to plumbing fixtures that provide water for drinking, bathing or culinary purposes, or for the processing of food, medical or pharmaceutical products. Unless otherwise provided in this code, potable water shall be supplied to all plumbing fixtures.

**602.3 Individual water supply.** *Deleted.*

**602.3.1 Sources.** *Deleted.*

**602.3.2 Minimum quantity.** *Deleted.*

**602.3.3 Water quality.** *Deleted.*

**602.3.4 Disinfection of system.** *Deleted.*

**602.3.5 Pumps.** *Deleted.*

**602.3.5.1 Pump enclosure.** *Deleted.*

## SECTION 603 WATER SERVICE

**603.1 Size of water service pipe.** The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in this code. The minimum diameter of water service pipe shall be  $\frac{3}{4}$  inch (19.1 mm).

**603.2 Separation of water service and building sewer.** Water service pipe and the building sewer shall be separated by 10 feet (1524 mm) of undisturbed or compacted earth.

**Exceptions:**

1. The required separation distance shall not apply where the bottom of the water service pipe within 10 feet (1524 mm) of the sewer is a minimum of 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials conform to Table 702.3.
2. Water service pipe is permitted to be located in the same trench with a building sewer, provided such sewer is constructed of materials listed in Table 702.2.

The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided the water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the sewer pipe center-line on both sides of such crossing with pipe materials listed in Table 605.3, 702.2 or 702.3.

**603.2.1 Water service near sources of pollution.** Potable water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits (see Section 605.1 for soil and groundwater conditions).

**603.3 Enforcement.** *Enforcement of the provisions of this section is the responsibility of the certified building official of the certified municipal, county, or township building department having jurisdiction or the superintendent of the division of industrial compliance.*

## SECTION 604 DESIGN OF BUILDING WATER DISTRIBUTION SYSTEM

**604.1 General.** The design of the water distribution system shall conform to accepted engineering practice. Methods utilized to determine pipe sizes shall be approved.

**604.2 System interconnection.** At the points of interconnection between the hot and cold water supply piping systems and the individual fixtures, appliances or devices, provisions shall be made to prevent flow between such piping systems.

**604.3 Water distribution system design criteria.** The water distribution system shall be designed, and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply pipe outlets shall not be less than shown in Table 604.3. The minimum flow rate and flow pressure provided to fixtures and appliances not listed in Table

604.3 shall be in accordance with the manufacturer's installation instructions.

**TABLE 604.3  
WATER DISTRIBUTION SYSTEM DESIGN CRITERIA REQUIRED  
CAPACITY AT FIXTURE SUPPLY PIPE OUTLETS**

FIXTURE SUPPLY OUTLET SERVING	FLOW RATE <sup>a</sup> (gpm)	FLOW PRESSURE (psi)
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	20
Bidet, thermostatic mixing valve	2	20
Combination fixture	4	8
Dishwasher, residential	2.75	8
Drinking fountain	0.75	8
Laundry tray	4	8
Lavatory	2	8
Shower	3	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	3	20
Sillcock, hose bibb	5	8

Sink, residential	2.5	8
Sink, service	3	8
Urinal, valve	12	25
Water closet, blow out, flushometer valve	25	45
Water closet, flushometer tank	1.6	20
Water closet, siphonic, flushometer valve	25	35
Water closet, tank, close coupled	3	20
Water closet, tank, one piece	6	20

For SI: 1 pound per square inch = 6.895 kPa

1 gallon per minute = 3.785 L/m.

a. For additional requirements for flow rates and quantities, see Section 604.4.

**604.4 Maximum flow and water consumption.** The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table 604.4.

**Exceptions:**

1. Blowout design water closets having a maximum water consumption of 3½ gallons (13 L) per flushing cycle.
2. Vegetable sprays.
3. Clinical sinks having a maximum water consumption of 4½ gallons (17 L) per flushing cycle.
4. Service sinks.
5. Emergency showers.

**TABLE 604.4  
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING  
FIXTURES AND FIXTURE FITTINGS**

<b>PLUMBING FIXTURE OR FIXTURE FITTING</b>	<b>MAXIMUM FLOW RATE OR QUANTITY<sup>b</sup></b>
Lavatory, private	2.2 gpm at 60 psi
Lavatory, public (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head <sup>a</sup>	2.5 gpm at 80 psi
Sink faucet	2.2 gpm at 60 psi
Urinal	1.0 gallon per flushing cycle
Water closet	1.6 gallons per flushing cycle

For SI: 1 gallon = 3.785 L  
 1 gallon per minute = 3.785 L/m  
 1 pound per square inch = 6.895 kPa.  
 a. A hand-held shower spray is a shower head.  
 b. Consumption tolerances shall be determined from referenced standards.

**604.5 Size of fixture supply.** The minimum size of a fixture supply pipe shall be as shown in Table 604.5. The fixture supply pipe shall not terminate more than 30 inches (762 mm) from the point of connection to the fixture. A reduced-size flexible water connector installed between the supply pipe and the fixture shall be of an approved type. The supply pipe shall extend to the floor or wall adjacent to the fixture. The minimum size of individual distribution lines utilized in gridded or parallel water distribution systems shall be as shown in Table 604.5.

**604.6 Variable street pressures.** Where street water main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

**604.7 Inadequate water pressure.** Wherever water pressure from the street main or other source of supply is insufficient to provide flow pressures at fixture outlets as required under Table 604.3, a water pressure booster system conforming to Section 606.5 shall be installed on the building water supply system.

**TABLE 604.5**  
**MINIMUM SIZES OF FIXTURE WATER SUPPLY PIPES**

FIXTURE	MINIMUM PIPE SIZE (inch)
Bathtubs <sup>a</sup> (60" x 32" and smaller)	1/2
Bathtubs <sup>a</sup> (larger than 60" x 32" )	1/2
Bidet	3/8
Combination sink and tray	1/2
Dishwasher, domestic <sup>a</sup>	1/2
Drinking fountain	3/8
Hose bibbs	1/2
Kitchen sink <sup>a</sup>	1/2
Laundry, 1, 2 or 3 compartments <sup>a</sup>	1/2
Lavatory	3/8
Shower, single head <sup>a</sup>	1/2

Sinks, flushing rim	3/4
Sinks, service	1/2
Urinal, flush tank	1/2
Urinal, flush flushometer valve	3/4
Wall hydrant	1/2
Water closet, flush tank	3/8
Water closet, flush flushometer valve	1
Water closet, flushometer tank	3/8
Water closet, one piece <sup>a</sup>	1/2

For SI: 1 inch = 25.4 mm

1 foot = 304.8 mm

1 pound per square inch = 6.895 kPa.

a. Where the developed length of the distribution line is 60 feet or less, and the available pressure at the meter is a minimum of 35 psi, the minimum size of an individual distribution line supplied from a manifold and installed as part of a parallel water distribution system shall be one nominal tube size smaller than the sizes indicated.

**604.8 Water-pressure reducing valve or regulator.** Where water pressure within a building exceeds 80 psi (552 kPa) static, an approved water-pressure reducing valve conforming to ASSE 1003 *or* CSA B356 with strainer shall be installed to reduce the pressure in the building water distribution piping to 80 psi (552 kPa) static or less.

**Exception:** Service lines to sill cocks and outside hydrants, and main supply risers where pressure from the mains is reduced to 80 psi (552 kPa) or less at individual fixtures.

**604.8.1 Valve design.** The pressure-reducing valve shall be designed to remain open to permit uninterrupted water flow in case of valve failure.

**604.8.2 Repair and removal.** All water-pressure reducing valves, regulators and strainers shall 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.

**604.9 Water hammer.** The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Water-hammer arrestors shall conform to ASSE 1010.

**604.10 Gridded and parallel water distribution system manifolds.** Hot water and cold water manifolds installed with gridded or parallel connected individual distribution lines to each fixture or fixture fitting shall be designed in accordance with Sections 604.10.1 through 604.10.3.

**604.10.1 Manifold sizing.** Hot water and cold water manifolds shall be sized in accordance with Table 604.10.1. The total gallons per minute is the demand of all outlets supplied.

**TABLE 604.10.1  
MANIFOLD SIZING**

NOMINAL SIZE INTERNAL DIAMETER (inches)	MAXIMUM DEMAND (gpm)	
	Velocity at 4 feet per second	Velocity at 8 feet per second
½	2	5
¾	6	11
1	10	20
1 ¼	15	31
1 ½	22	44

For SI: 1 inch = 25.4 mm  
1 gallon per minute = 3.785 L/m  
1 foot per second = 0.305 m/s.

**604.10.2 Valves.** Individual fixture shutoff valves installed at the manifold shall be identified as to the fixture being supplied.

**604.10.3 Access.** Access shall be provided to manifolds with integral factory- or field-installed valves.

**604.11 Individual pressure balancing in-line valves for individual fixture fittings.** Where individual pressure balancing in-line valves for individual fixture fittings are installed, such valves shall comply with ASSE 1066. Such valves shall be installed in an accessible location and shall not be utilized alone as a substitute for the balanced pressure, thermostatic or combination shower valves required in Section 424.3.

## SECTION 605 MATERIALS, JOINTS AND CONNECTIONS

**605.1 Soil and ground water.** The installation of a water service or water distribution pipe shall be prohibited in soil and ground water contaminated with

solvents, fuels, organic compounds or other detrimental materials causing permeation, corrosion, degradation or structural failure of the piping material. Where detrimental conditions are suspected, a chemical analysis of the soil and ground water conditions shall be required to ascertain the acceptability of the water service or water distribution piping material for the specific installation. Where detrimental conditions exist, approved alternative materials or routing shall be required.

**605.2 Lead content of drinking water pipe and fittings.** *Pipe, pipe fittings, joints, valves, faucets, and fixture fittings utilized to supply water for drinking or cooking purposes shall comply with NSF 372 and shall have a weighted average lead content of 0.25 percent lead or less.*

**Exceptions:** *The following items are exempt from the lead content limitations of this section (even though the potable water supply pipe which serves the fixture or supplies the nonpotable water system is not exempt):*

- 1. Pipes, pipe fittings, plumbing fittings, or fixtures, including backflow preventers that are used exclusively for nonpotable services such as process piping, irrigation piping, and outdoor watering piping.*
- 2. Toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, and service saddles.*
- 3. Water distribution main gate valves two inches in diameter or larger.*

**605.3 Water service pipe.** Water service pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.3. All water service pipe or tubing, installed underground and outside of the structure, shall have a minimum working pressure rating of 160 psi (1100 kPa) at 73.4°F (23°C). Where the water pressure exceeds 160 psi (1100 kPa), piping material shall have a minimum rated working pressure equal to the highest available pressure. Water service piping materials not third-party certified for water distribution shall terminate at or before the full open valve located at the entrance to the structure. All ductile iron water service piping shall be cement mortar lined in accordance with AWWA C104.

**605.3.1 Dual check-valve-type backflow preventer.** Where a dual check-valve backflow preventer is installed on the water supply system, it shall comply with ASSE 1024 or CSA B64.6.

**605.4 Water distribution pipe.** Water distribution pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.4. All hot water distribution pipe and tubing shall have a minimum pressure rating of 100 psi (690 kPa) at 180°F (82°C).

**605.5 Fittings.** Pipe fittings shall be approved for installation with the piping material installed and shall comply with the applicable standards listed in Table 605.5. All pipe fittings utilized in water supply systems shall also comply with NSF 61. Ductile and gray iron pipe fittings shall be cement mortar lined in accordance with AWWA C104.

**605.5.1 Mechanically formed tee fittings.** Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.

**605.5.1.1 Full flow assurance.** Branch tubes shall not restrict the flow in the run tube. A dimple/depth stop shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed <sup>1/4</sup> inch (6.4 mm) above the first dimple. Dimples shall be aligned with the tube run.

**605.5.1.2 Brazed joints.** Mechanically formed tee fittings shall be brazed in accordance with Section 605.14.1.

**605.6 Flexible water connectors.** Flexible water connectors exposed to continuous pressure shall conform to ASME A112.18.6/CSA B125.6. Access shall be provided to all flexible water connectors.

**605.7 Valves.** All valves shall be of an approved type and compatible with the type of piping material installed in the system. Ball valves, gate valves, globe valves and plug valves intended to supply drinking water shall meet the requirements of NSF 61.

**TABLE 605.3  
WATER SERVICE PIPE**

<b>MATERIAL</b>	<b>STANDARD</b>
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 1527; ASTM D 2282
Asbestos-cement pipe	ASTM C 296
Brass pipe	ASTM B 43
Chlorinated polyvinyl chloride (CPVC) plastic pipe	ASTM D 2846; ASTM F 441; ASTM F 442; CSA B137.6
Copper or copper-alloy pipe	ASTM B 42; ASTM B 302
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 447
Cross-linked polyethylene (PEX) plastic <i>pipe and</i> tubing	ASTM F 876; ASTM F 877; <u>AWWA C904</u> ; CSA B137.5
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F 1281; ASTM F 2262; CAN/CSA B137.10M
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986
Ductile iron water pipe	AWWA C151; AWWA C115
Galvanized steel pipe	ASTM A 53
Polyethylene (PE) plastic pipe	ASTM D 2239; ASTM D 3035; <u>AWWA C901</u> ; CSA B137.1
Polyethylene (PE) plastic tubing	ASTM D 2737; <u>AWWA C901</u> ; CSA B137.1

Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	ASTM F 1282; CAN/CSA B137.9
<i>Polyethylene of raised temperature (PE-RT) plastic tubing</i>	<i>ASTM F2769</i>
Polypropylene (PP) plastic pipe or tubing	ASTM F 2389; CSA B137.11
Polyvinyl chloride (PVC) plastic pipe	ASTM D 1785; ASTM D 2241; ASTM D 2672; CSA B137.3
Stainless steel pipe (Type 304/304L)	ASTM A 312; ASTM A 778
Stainless steel pipe (Type 316/316L)	ASTM A 312; ASTM A 778

**TABLE 605.4  
WATER DISTRIBUTION PIPE**

<b>MATERIAL</b>	<b>STANDARD</b>
Brass pipe	ASTM B 43
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D 2846; ASTM F 441; ASTM F 442; CSA B137.6
Copper or copper-alloy pipe	ASTM B 42; ASTM B 302
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 447
Cross-linked polyethylene (PEX) plastic tubing	ASTM F 876; ASTM F 877; CSA B137.5
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F 1281; ASTM F 2262; CAN/CSA B137.10M
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986
Ductile iron pipe	AWWA C151/A21.51; AWWA C115/A21.15
Galvanized steel pipe	ASTM A 53
Polyethylene/aluminum/polyethylene (PE-AL-PE) composite pipe	ASTM F 1282
<i>Polyethylene of raised temperature (PE-RT) plastic tubing</i>	<i>ASTM F2769</i>
Polypropylene (PP) plastic pipe or tubing	ASTM F 2389; CSA B137.11
Stainless steel pipe (Type 304/304L)	ASTM A 312; ASTM A 778
Stainless steel pipe (Type 316/316L)	ASTM A 312; ASTM A 778

**TABLE 605.5  
PIPE FITTINGS**

<b>MATERIAL</b>	<b>STANDARD</b>
Acrylonitrile butadiene styrene (ABS) plastic	ASTM D 2468
Cast-iron	ASME B16.4; ASME B16.12
Chlorinated polyvinyl chloride (CPVC) plastic	ASSE 1061; ASTM D 2846; ASTM F 437; ASTM F 438; ASTM F 439; CSA B137.6
Copper or copper alloy	ASSE 1061; ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986

Fittings for cross-linked polyethylene (PEX) plastic tubing	ASSE 1061; ASTM F 877; ASTM F 1807; ASTM F 1960; ASTM F 2080; ASTM F 2098; ASTM F 2159; ASTM F 2434; <u>ASTM F2735</u> ; CSA B137.5
<u>Fittings for polyethylene of raised temperature (PE-RT) plastic tubing</u>	<u>ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735</u>
Gray iron and ductile iron	AWWA C110; AWWA C153
Insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F 1974; ASTM F1281; ASTM F1282; CAN/CSA B137.9; CAN/CSA B137.10
Malleable iron	ASME B16.3
Metal (brass) insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F 1974
Polyethylene (PE) plastic pipe	ASTM D 2609; ASTM D 2683; ASTM D 3261; ASTM F 1055; CSA B137.1
Polypropylene (PP) plastic pipe or tubing	ASTM F 2389; CSA B137.11
Polyvinyl chloride (PVC) plastic	ASTM D 2464; ASTM D 2466; ASTM D 2467; CSA B137.2; CSA B137.3
Stainless steel (Type 304/304L)	ASTM A 312; ASTM A 778
Stainless steel (Type 316/316L)	ASTM A 312; ASTM A 778
Steel	ASME B16.9; ASME B16.11; ASME B16.28

**605.8 Manufactured pipe nipples.** Manufactured pipe nipples shall conform to one of the standards listed in Table 605.8.

**TABLE 605.8  
MANUFACTURED PIPE NIPPLES**

MATERIAL	STANDARD
Brass-, copper-, chromium-plated	ASTM B 687
Steel	ASTM A 733

**605.9 Prohibited joints and connections.** The following types of joints and connections shall be prohibited:

1. Cement or concrete joints.
2. Joints made with fittings not approved for the specific installation.
3. Solvent-cement joints between different types of plastic pipe.
4. Saddle-type fittings.

**605.10 ABS plastic.** Joints between ABS plastic pipe or fittings shall comply with Sections 605.10.1 through 605.10.3.

- 605.10.1 Mechanical joints.** Mechanical joints on water pipes shall be made with an elastomeric seal conforming to ASTM D 3139. Mechanical joints shall only be installed in underground systems, unless otherwise approved. Joints shall be installed only in accordance with the manufacturer's instructions.
- 605.10.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D 2235 shall be applied to all joint surfaces. The joint shall be made while the cement is wet. Joints shall be made in accordance with ASTM D 2235. Solvent-cement joints shall be permitted above or below ground.
- 605.10.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.
- 605.11 Asbestos-cement.** Joints between asbestos-cement pipe or fittings shall be made with a sleeve coupling of the same composition as the pipe, sealed with an elastomeric ring conforming to ASTM D 1869.
- 605.12 Brass.** Joints between brass pipe or fittings shall comply with Sections 605.12.1 through 605.12.4.
- 605.12.1 Brazed joints.** All joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.
- 605.12.2 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.
- 605.12.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.
- 605.12.4 Welded joints.** All joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.
- 605.13 Gray iron and ductile iron joints.** Joints for gray and ductile iron pipe and fittings shall comply with AWWA C111 and shall be installed in accordance with the manufacturer's installation instructions.
- 605.14 Copper pipe.** Joints between copper or copper-alloy pipe or fittings shall comply with Sections 605.14.1 through 605.14.5.
- 605.14.1 Brazed joints.** All joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.
- 605.14.2 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.
- 605.14.3 Soldered joints.** Solder joints shall be made in accordance with the methods of ASTM B 828. All cut tube ends shall be reamed to the full inside

diameter of the tube end. All joint surfaces shall be cleaned. A flux conforming to ASTM B 813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B 32. The joining of water supply piping shall be made with lead-free solder and fluxes. "Lead free" shall mean a chemical composition equal to or less than 0.2-percent lead.

**605.14.4 Threaded joints.** Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

**605.14.5 Welded joints.** All joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.

**605.15 Copper tubing.** Joints between copper or copper-alloy tubing or fittings shall comply with Sections 605.15.1 through 605.15.4.

**605.15.1 Brazed joints.** All joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.

**605.15.2 Flared joints.** Flared joints for water pipe shall be made by a tool designed for that operation.

**605.15.3 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**605.15.4 Soldered joints.** Solder joints shall be made in accordance with the methods of ASTM B 828. All cut tube ends shall be reamed to the full inside diameter of the tube end. All joint surfaces shall be cleaned. A flux conforming to ASTM B 813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B 32. The joining of water supply piping shall be made with lead-free solders and fluxes. "Lead free" shall mean a chemical composition equal to or less than 0.2-percent lead.

**605.16 CPVC plastic.** Joints between CPVC plastic pipe or fittings shall comply with Sections 605.16.1 through 605.16.3.

**605.16.1 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**605.16.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture, and an approved primer shall be applied. Solvent cement, orange in color and conforming to ASTM F 493, shall be applied to all joint surfaces. The joint shall be made while the cement is wet, and in accordance with ASTM D 2846 or ASTM F 493. Solvent-cement joints shall be permitted above or below ground.

**Exception:** A primer is not required where all of the following conditions apply:

1. The solvent cement used is third-party certified as conforming to ASTM F 493.
2. The solvent cement used is yellow in color.

3. The solvent cement is used only for joining  $\frac{1}{2}$  inch (12.7 mm) through 2 inch (51 mm) diameter CPVC pipe and fittings.
4. The CPVC pipe and fittings are manufactured in accordance with ASTM D 2846.

**605.16.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe, but the pressure rating of the pipe shall be reduced by 50 percent. Thread by socket molded fittings shall be permitted. Approved thread lubricant or tape shall be applied on the male threads only.

**605.17 Cross-linked polyethylene plastic.** Joints between cross-linked polyethylene plastic tubing or fittings shall comply with Sections 605.17.1 and 605.17.2.

**605.17.1 Flared joints.** Flared pipe ends shall be made by a tool designed for that operation.

**605.17.2 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for cross-linked polyethylene (PEX) plastic tubing shall comply with the applicable standards listed in Table 605.5 and shall be installed in accordance with the manufacturer's instructions. PEX tubing shall be factory marked with the appropriate standards for the fittings that the PEX manufacturer specifies for use with the tubing.

**605.18 Steel.** Joints between galvanized steel pipe or fittings shall comply with Sections 605.18.1 and 605.18.2.

**605.18.1 Threaded joints.** Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

**605.18.2 Mechanical joints.** Joints shall be made with an approved elastomeric seal. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**605.19 Polyethylene plastic.** Joints between polyethylene plastic pipe and tubing or fittings shall comply with Sections 605.19.1 through 605.19.4.

**605.19.1 Flared joints.** Flared joints shall be permitted where so indicated by the pipe manufacturer. Flared joints shall be made by a tool designed for that operation.

**605.19.2 Heat-fusion joints.** Joint surfaces shall be clean and free from moisture. All joint surfaces shall be heated to melt temperature and joined. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM D 2657.

**605.19.3 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**605.19.4 Installation.** Polyethylene pipe shall be cut square, with a cutter designed for plastic pipe. Except where joined by heat fusion, pipe ends shall

be chamfered to remove sharp edges. Kinked pipe shall not be installed. The minimum pipe bending radius shall not be less than 30 pipe diameters, or the minimum coil radius, whichever is greater. Piping shall not be bent beyond straightening of the curvature of the coil. Bends shall not be permitted within 10 pipe diameters of any fitting or valve. Stiffener inserts installed with compression-type couplings and fittings shall not extend beyond the clamp or nut of the coupling or fitting.

**605.20 Polypropylene (PP) plastic.** Joints between PP plastic pipe and fittings shall comply with Section 605.20.1 or 605.20.2.

**605.20.1 Heat-fusion joints.** Heat-fusion joints for polypropylene pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, butt-fusion polypropylene fittings or electrofusion polypropylene fittings. Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F 2389.

**605.20.2 Mechanical and compression sleeve joints.**

Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.

**605.21 Polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX).** Joints between PE-AL-PE and PEX-AL-PEX pipe and fittings shall comply with Section 605.21.1.

**605.21.1 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for PE-AL-PE and PEX-AL-PEX as described in ASTM F 1974, ASTM F 1281, ASTM F 1282, CAN/CSA B137.9 and CAN/CSA B137.10 shall be installed in accordance with the manufacturer's instructions.

**605.22 PVC plastic.** Joints between PVC plastic pipe or fittings shall comply with Sections 605.22.1 through 605.22.3.

**605.22.1 Mechanical joints.** Mechanical joints on water pipe shall be made with an elastomeric seal conforming to ASTM D 3139. Mechanical joints shall not be installed in above-ground systems unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

**605.22.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A primer that conforms to ASTM F 656 shall be applied. Solvent cement conforming to ASTM D 2564 or CSA-B137.3 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent-cement joints shall be permitted above or below ground.

**605.22.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies

specifically designed for plastic pipe, but the pressure rating of the pipe shall be reduced by 50 percent. Thread by socket molded fittings shall be permitted. Approved thread lubricant or tape shall be applied on the male threads only.

**605.23 Stainless steel.** Joints between stainless steel pipe and fittings shall comply with Sections 605.23.1 and 605.23.2.

**605.23.1 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.

**605.23.2 Welded joints.** All joint surfaces shall be cleaned. The joint shall be welded autogenously or with an approved filler metal as referenced in ASTM A 312.

**605.24 Joints between different materials.** Joints between different piping materials shall be made with a mechanical joint of the compression or mechanical-sealing type, or as permitted in Sections 605.24.1, 605.24.2 and 605.24.3. Connectors or adapters shall have an elastomeric seal conforming to ASTM D 1869 or ASTM F 477. Joints shall be installed in accordance with the manufacturer's instructions.

**605.24.1 Copper or copper-alloy tubing to galvanized steel pipe.** Joints between copper or copper-alloy tubing and galvanized steel pipe shall be made with a brass fitting or dielectric fitting or a dielectric union conforming to ASSE 1079. The copper tubing shall be soldered to the fitting in an approved manner, and the fitting shall be screwed to the threaded pipe.

**605.24.2 Plastic pipe or tubing to other piping material.**

Joints between different grades of plastic pipe or between plastic pipe and other piping material shall be made with an approved adapter fitting.

**605.24.3 Stainless steel.** Joints between stainless steel and different piping materials shall be made with a mechanical joint of the compression or mechanical sealing type or a dielectric fitting or a dielectric union conforming to ASSE 1079.

**605.25 Polyethylene of raised temperature plastic. Joints between polyethylene of raised temperature plastic tubing and fittings shall be in accordance with Sections 605.25.1 and 605.25.2.**

**605.25.1 Flared joints.** *Flared pipe ends shall be made by a tool designed for that operation.*

**605.25.2 Mechanical joints.** *Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for polyethylene of raised temperature plastic tubing shall comply with the applicable standards listed in Table 605.5 and shall be installed in accordance with the manufacturer's instructions. Polyethylene of raised temperature plastic tubing*

shall be factory marked with the applicable standards for the fittings that the manufacturer of the tubing specifies for use with the tubing.

## **SECTION 606**

### **INSTALLATION OF THE BUILDING WATER DISTRIBUTION SYSTEM**

**606.1 Location of full-open valves.** Full-open valves shall be installed in the following locations:

1. On the building water service pipe from the public water supply near the curb.
2. On the water distribution supply pipe at the entrance into the structure.
3. On the discharge side of every water meter.
4. On the base of every water riser pipe.
5. On the top of every water down-feed pipe in occupancies other than one-, two-, and three-family residential occupancies.
6. On the entrance to every water supply pipe to a dwelling unit, except where supplying a single fixture equipped with individual stops.
7. On the water supply pipe to a gravity or pressurized water tank.
8. On the water supply pipe to every water heater.

**606.2 Location of shutoff valves.** Shutoff valves shall be installed in the following locations:

1. On the fixture supply to each plumbing fixture other than in individual sleeping units that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies.
2. On the water supply pipe to each sillcock.
3. On the water supply pipe to each appliance or mechanical equipment.

**606.3 Access to valves.** Access shall be provided to all full-open valves and shutoff valves.

**606.4 Valve identification.** Service and hose bibb valves shall be identified. All other valves installed in locations that are not adjacent to the fixture or appliance shall be identified, indicating the fixture or appliance served.

**606.5 Water pressure booster systems.** Water pressure booster systems shall be provided as required by Sections 606.5.1 through 606.5.10.

**606.5.1 Water pressure booster systems required.** Where the water pressure in the public water main or individual water supply system is insufficient to supply the minimum pressures and quantities specified in this code, the supply shall be supplemented by an elevated water tank, a hydropneumatic pressure booster system or a water pressure booster pump installed in accordance with Section 606.5.5.

**606.5.2 Support.** All water supply tanks shall be supported in accordance with the *building code*.

**606.5.3 Covers.** All water supply tanks shall be covered to keep out unauthorized persons, dirt and vermin. The covers of gravity tanks shall be vented with a return bend vent pipe with an area not less than the area of the down-feed riser pipe, and the vent shall be screened with a corrosion-resistant screen of not less than 16 by 20 mesh per inch (630 by 787 mesh per m).

**606.5.4 Overflows for water supply tanks.** Each gravity or suction water supply tank shall be provided with an overflow with a diameter not less than that shown in Table

606.5.4. The overflow outlet shall discharge at a point not less than 6 inches (152 mm) above the roof or roof drain; floor or floor drain; or over an open water-supplied fixture. The overflow outlet shall be covered with a corrosion-resistant screen of not less than 16 by 20 mesh per inch (630 by 787 mesh per m) and by 1/4-inch (6.4 mm) hardware cloth or shall terminate in a horizontal angle seat check valve. Drainage from overflow pipes shall be directed so as not to freeze on roof walks.

**TABLE 606.5.4  
SIZES FOR OVERFLOW PIPES FOR WATER SUPPLY TANKS**

MAXIMUM CAPACITY OF WATER SUPPLY LINE TO TANK (gpm)	DIAMETER OF OVERFLOW PIPE (inches)
0 - 50	2
51 - 150	2 ½
151 - 200	3
201 - 400	4
401 - 700	5
701 - 1,000	6
Over 1,000	8

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m.

**606.5.5 Low-pressure cutoff required on booster pumps.** *In accordance with rule 3745-95-07 of the Administrative Code, a low-pressure cutoff ~~or~~ a low suction throttling valve, or variable speed suction limiting controls shall be installed on all booster pumps in a water pressure booster system to prevent creation of a vacuum or negative pressure on the suction side of the pump when a positive pressure of 10 psi (68.94 kPa) or less occurs on the suction side of the pump while the pump is operating. Enforcement of the referenced*

rule is the responsibility of the “Ohio Environmental Protection Agency” or the local water ~~purveyor~~ supplier.

**606.5.6 Potable water inlet control and location.** Potable water inlets to gravity tanks shall be controlled by a fill valve or other automatic supply valve installed so as to prevent the tank from overflowing. The inlet shall be terminated so as to provide an *air gap* not less than 4 inches (102 mm) above the overflow.

**606.5.7 Tank drain pipes.** A valved pipe shall be provided at the lowest point of each tank to permit emptying of the tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table 606.5.7.

**TABLE 606.5.7  
SIZE OF DRAIN PIPES FOR WATER TANKS**

TANK CAPACITY (gallons)	DRAIN PIPE (inches)
Up to 750	1
751 to 1,500	1 ½
1,501 to 3,000	2
3,001 to 5,000	2 ½
5,000 to 7,500	3
Over 7,500	4

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L.

**606.5.8 Prohibited location of potable supply tanks.** Potable water gravity tanks or manholes of potable water pressure tanks shall not be located directly under any soil or waste piping or any source of contamination.

**606.5.9 Pressure tanks, vacuum relief.** All water pressure tanks shall be provided with a vacuum relief valve at the top of the tank that will operate up to a maximum water pressure of 200 psi (1380 kPa) and up to a maximum temperature of 200°F (93°C). The minimum size of such vacuum relief valve shall be ½ inch (12.7 mm).

**Exception:** This section shall not apply to pressurized captive air diaphragm/bladder tanks.

**606.5.10 Pressure relief for tanks.** Every pressure tank in a hydropneumatic pressure booster system shall be protected with a pressure relief valve. The pressure relief valve shall be set at a maximum pressure equal to the rating of the tank. The relief valve shall be installed on the supply pipe to the tank or on the tank. The relief valve shall discharge by gravity to a safe place of disposal.

**606.6 Water supply system test.** Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested in accordance with Section 312.

## **SECTION 607 HOT WATER SUPPLY SYSTEM**

**607.1 Where required.** In residential occupancies, hot water shall be supplied to all plumbing fixtures and equipment utilized for bathing, washing, culinary purposes, cleansing, laundry or building maintenance. In nonresidential occupancies, hot water shall be supplied for culinary purposes, cleansing, laundry or building maintenance purposes. In nonresidential occupancies, hot water or tempered water shall be supplied for bathing and washing purposes. *Tempered water shall be delivered from public hand-washing facilities.* Tempered water shall be supplied through a water temperature limiting device that conforms to ASSE 1070 and shall limit the tempered water to a maximum of 110°F (43°C). This provision shall not supersede the requirement for protective shower valves in accordance with Section 424.3.

**607.1.1 Temperature limiting means.** *A thermostat control for a water heater shall not serve as the temperature limiting means for the purposes of complying with the requirements of this code for maximum allowable hot or tempered water delivery temperature at fixtures.*

**607.2 Hot water supply temperature maintenance.** Where the developed length of hot water piping from the source of hot water supply to the farthest fixture exceeds 100 feet (30 480 mm), the hot water supply system shall be provided with a method of maintaining the temperature in accordance with the *applicable standard referenced in Chapter 13 of the building code or Chapter 11 of the “Residential Code of Ohio”*.

**607.2.1 Piping insulation.** Circulating hot water system piping shall be insulated in accordance with the *applicable standard referenced in Chapter 13 of the building code or Chapter 11 of the “Residential Code of Ohio”*.

**607.2.2 Hot water system controls.** Automatic circulating hot water system pumps or heat trace shall be arranged to be conveniently turned off, automatically or manually, when the hot water system is not in operation.

**607.2.3 Recirculating pump.** Where a thermostatic mixing valve is used in a system with a hot water recirculating pump, the hot water or tempered water return line shall be routed to the cold water inlet pipe of the water heater and the cold water inlet pipe or the hot water return connection of the thermostatic mixing valve.

**607.3 Thermal expansion control.** A means of controlling increased pressure caused by thermal expansion shall be provided where required in accordance with Sections 607.3.1 and 607.3.2.

**607.3.1 Pressure-reducing valve.** For water service system sizes up to and including 2 inches (51 mm), a device for controlling pressure shall be installed where, because of thermal expansion, the pressure on the downstream side of a pressure-reducing valve exceeds the pressure-reducing valve setting.

**607.3.2 Backflow prevention device or check valve.** Where a containment or isolation backflow prevention device, check valve or other device is installed on a water supply system utilizing storage water heating equipment such that thermal expansion causes an increase in pressure, a device for controlling pressure shall be installed.

**607.4 Flow of hot water to fixtures.** Fixture fittings, faucets and diverters shall be installed and adjusted so that the flow of hot water from the fittings corresponds to the left-hand side of the fixture fitting.

**Exception:** Shower and tub/shower mixing valves conforming to ASSE 1016 or ASME A112.18.1/CSA B125.1, where the flow of hot water corresponds to the markings on the device.

## SECTION 608 PROTECTION OF POTABLE WATER SUPPLY

**608.1 General.** A potable water supply system within a building shall be designed, installed and maintained in such a manner so as to prevent contamination from nonpotable liquids, solids or gases being introduced into the building potable water supply through cross-connections or any other piping connections to the system. ~~Backflow preventer~~ Isolation backflow prevention device applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.16.10.

**608.2 Plumbing fixtures.** The supply lines and fittings for every plumbing fixture shall be installed so as to prevent backflow. Plumbing fixture fittings shall provide backflow protection in accordance with ASME A112.18.1.

**608.3 Devices, appurtenances, appliances and apparatus.** All devices, appurtenances, appliances and apparatus intended to serve some special function, such as sterilization, distillation, processing, cooling, or storage of ice or foods, and that connect to the water supply system, shall be provided with protection against backflow and contamination of the water supply system. Water pumps, water-powered sump pumps, filters, softeners, tanks and all other appliances and devices that handle or treat potable water shall be protected against contamination.

**608.3.1 Special equipment, water supply protection.** The water supply for hospital fixtures shall be protected against backflow with a reduced pressure principle backflow preventer, an atmospheric or spill-proof vacuum breaker, or an air gap. Vacuum breakers for bedpan washer hoses shall not be located less than 5 feet (1524 mm) above the floor. Vacuum breakers for hose connections in health care or laboratory areas shall not be less than 6 feet (1829 mm) above the floor.

**608.4 Water service piping.** Water service piping shall be protected in accordance with Sections 603.2 and 603.2.1.

**608.5 Chemicals and other substances.** Chemicals and other substances that produce either toxic conditions, taste, odor or discoloration in a potable water system shall not be introduced into, or utilized in, such systems.

**608.6 Cross-connection control.** Cross connections shall be prohibited, except where *approved* protective devices are installed.

**608.6.1 Private water supplies.** Cross connections between a private water supply and a potable public supply shall be prohibited.

**608.7 Valves and outlets prohibited below grade.** Potable water outlets and combination stop-and-waste valves shall not be installed underground or below grade. Freezeproof yard hydrants that drain the riser into the ground are considered to be stop-and-waste valves.

**Exception:** Freezeproof yard hydrants that drain the riser into the ground shall be permitted to be installed, provided that the potable water supply to such hydrants is protected upstream of the hydrants in accordance with Section 608 and the hydrants are permanently identified as nonpotable outlets by approved signage that reads as follows: "Nonpotable-not safe for drinking."

**608.8 Identification of nonpotable water.** In buildings where nonpotable water systems are installed, the piping conveying the nonpotable water shall be identified either by color marking or metal tags in accordance with Sections 608.8.1 through 608.8.3. All nonpotable water outlets such as hose connections, open ended pipes, and faucets shall be identified at the point of use for each outlet with the words, "Nonpotable-not safe for drinking." The words shall be indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inches in height and color in contrast to the background on which they are applied.

**608.8.1 Information.** Pipe identification shall include the contents of the piping system and an arrow indicating the direction of flow. Hazardous piping systems shall also contain information addressing the nature of the hazard. Pipe identification shall be repeated at maximum intervals of 25 feet (7620 mm) and at each point where the piping passes through a wall, floor or roof.

Lettering shall be readily observable within the room or space where the piping is located.

**608.8.2 Color.** The color of the pipe identification shall be discernable and consistent throughout the building. The color purple shall be used to identify reclaimed, rain and gray water distribution systems.

**TABLE 608.1  
APPLICATION OF BACKFLOW PREVENTERS**

DEVICE	DEGREE OF HAZARD <sup>a</sup>	APPLICATION <sup>b</sup>	APPLICABLE STANDARDS
Air gap	High or low hazard	Backsiphonage or backpressure	ASME A112.1.2
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	High or low hazard	Backsiphonage or backpressure	ASME A112.1.3
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002, CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes ¼" - 3/8"	ASSE 1022
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes ¼" - 3/4"	ASSE 1012, CAN/CSA B64.3
Barometric loop	High or low hazard	Backsiphonage only	(See Section 608.13.4)
Double check backflow prevention assembly and double check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes 3/8" - 16"	ASSE 1015, AWWA C510, CSA B64.5, CSA B64.5.1
Double check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage (Fire sprinkler systems) Sizes 2" - 16"	ASSE 1048
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes ¼" - 1"	ASSE 1024, CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes ½" - 1"	ASSE 1052, CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes ½" , ¾" , 1"	ASSE 1011, CAN/CSA B64.2, CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035, CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes ¼" - 4"	ASSE 1001, CAN/CSA B64.1.1

Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes ½" - 2"	ASSE 1020, CSA B64.1.2
Reduced pressure principle backflow preventer and reduced pressure principle fire protection backflow preventer	High or low hazard	Backpressure or backsiphonage Sizes 3/8" - 16"	ASSE 1013, AWWA C511, CAN/CSA B64.4, CSA B64.4.1
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (Fire sprinkler systems)	ASSE 1047
Spillproof vacuum breaker	High or low hazard	Backsiphonage only Sizes ¼" - 2"	ASSE 1056
Vacuum breaker wall hydrants, frost-resistant, automatic draining type	High or low hazard	Low head backpressure or backsiphonage Sizes ¾" , 1"	ASSE 1019, CAN/CSA B64.2.2

For SI: 1 inch = 25.4 mm.

- a. Low hazard—See Pollution (Section 202).  
High hazard—See Contamination (Section 202).
- b. See Backpressure (Section 202).  
See Backpressure, low head (Section 202).  
See Backsiphonage (Section 202).

**608.8.3 Size.** The size of the background color field and lettering shall comply with Table 608.8.3.

**TABLE 608.8.3  
SIZE OF PIPE IDENTIFICATION**

PIPE DIAMETER (inches)	LENGTH BACKGROUND COLOR FIELD (inches)	SIZE OF LETTERS (inches)
¾ to 1 ¼	8	0.5
1 ½ to 2	8	0.75
2 ½ to 6	12	1.25
8 to 10	24	2.5
over 10	32	3.5

For SI: 1 inch = 25.4 mm.

**608.9 Reutilization prohibited.** Water utilized for the cooling of equipment or other processes shall not be returned to the potable water system. Such water shall be discharged into a drainage system through an air gap or shall be utilized for non-potable purposes.

**608.10 Reuse of piping.** Piping that has been utilized for any purpose other than conveying potable water shall not be utilized for conveying potable water.

**608.11 Painting of water tanks.** The interior surface of a potable water tank shall not be lined, painted or repaired with any material that changes the taste, odor, color or potability of the water supply when the tank is placed in, or returned to, service.

**608.12 Pumps and other appliances.** Water pumps, *water-powered sump pumps*, filters, softeners, tanks and all other devices that handle or treat potable water shall be protected against contamination.

**608.13 Backflow protection.** Means of protection against backflow shall be provided in accordance with Sections 608.13.1 through 608.13.9.

**608.13.1 Air gap.** The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood level rim of the fixture or receptacle into which such potable water outlet discharges. Air gaps shall comply with ASME A112.1.2 and air gap fittings shall comply with ASME A112.1.3.

**608.13.2 Reduced pressure principle backflow preventers.** Reduced pressure principle backflow preventers shall conform to ASSE 1013, AWWA C511, CAN/CSA B64.4 or CSA B64.4.1. Reduced pressure detector assembly backflow preventers shall conform to ASSE 1047. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

**608.13.3 Backflow preventer with intermediate atmospheric vent.** Backflow preventers with intermediate atmospheric vents shall conform to ASSE 1012 or CAN/CSA B64.3. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

**608.13.4 Barometric loop.** Barometric loops shall precede the point of connection and shall extend vertically to a height of 35 feet (10 668 mm). A barometric loop shall only be utilized as an atmospheric-type or pressure-type vacuum breaker.

**608.13.5 Pressure-type vacuum breakers.** Pressure-type vacuum breakers shall conform to ASSE 1020 or CSA B64.1.2 and spillproof vacuum breakers shall comply with ASSE 1056. These devices are designed for installation under continuous pressure conditions when the critical level is installed at the required height. Pressure-type vacuum breakers shall not be installed in locations where spillage could cause damage to the structure.

**608.13.6 Atmospheric-type vacuum breakers.** Pipe-applied atmospheric-type vacuum breakers shall conform to ASSE 1001 or CAN/CSA B64.1.1. Hose-connection vacuum breakers shall conform to ASSE 1011, ASSE 1019,

ASSE 1035, ASSE 1052, CAN/CSA B64.2, CSA B64.2.1, CSA B64.2.1.1, CAN/CSA B64.2.2 or CSA B64.7. These devices shall operate under normal atmospheric pressure when the critical level is installed at the required height.

**608.13.7 Double check-valve assemblies.** Double check-valve assemblies shall conform to ASSE 1015, CSA B64.5, CSA B64.5.1 or AWWA C510. Double-detector check-valve assemblies shall conform to ASSE 1048. These devices shall be capable of operating under continuous pressure conditions.

**608.13.8 Spillproof vacuum breakers.** Spillproof vacuum breakers (SVB) shall conform to ASSE 1056. These devices are designed for installation under continuous-pressure conditions when the critical level is installed at the required height.

**608.13.9 Chemical dispenser backflow devices.** Back-flow devices for chemical dispensers shall comply with ASSE 1055 or shall be equipped with an air gap fitting.

**608.14 Location of backflow preventers.** Access shall be provided to backflow preventers as specified by the installation instructions of the approved manufacturer.

**608.14.1 Outdoor enclosures for backflow prevention devices.** Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

**608.14.2 Protection of backflow preventers.** Backflow preventers shall not be located in areas subject to freezing except where they can be removed by means of unions or are protected from freezing by heat, insulation or both.

**608.14.2.1 Relief port piping.** The termination of the piping from the relief port or air gap fitting of a backflow preventer shall discharge to an approved indirect waste receptor or to the outdoors where it will not cause damage or create a nuisance.

**608.15 Protection of potable water outlets.** All potable water openings and outlets shall be protected against backflow in accordance with Section 608.15.1, 608.15.2, 608.15.3, 608.15.4, 608.15.4.1 or 608.15.4.2.

**608.15.1 Protection by air gap.** Openings and outlets shall be protected by an air gap between the opening and the fixture flood level rim as specified in Table 608.15.1. Openings and outlets equipped for hose connection shall be protected by means other than an air gap.

**608.15.2 Protection by a reduced pressure principle backflow preventer.** Openings and outlets shall be protected by a reduced pressure principle backflow preventer.

**608.15.3 Protection by a backflow preventer with intermediate atmospheric vent.** Openings and outlets shall be protected by a backflow preventer with an intermediate atmospheric vent.

**608.15.4 Protection by a vacuum breaker.** Openings and outlets shall be protected by atmospheric-type or pressure-type vacuum breakers. The critical level of the vacuum breaker shall be set a minimum of 6 inches (152 mm) above the flood level rim of the fixture or device. Fill valves shall be set in accordance with Section 425.3.1. Vacuum breakers shall not be installed under exhaust hoods or similar locations that will contain toxic fumes or vapors. Pipe-applied vacuum breakers shall be installed not less than 6 inches (152 mm) above the flood level rim of the fixture, receptor or device served.

**608.15.4.1 Deck-mounted and integral vacuum breakers.** Approved deck-mounted or equipment-mounted vacuum breakers and faucets with integral atmospheric or spillproof vacuum breakers shall be installed in accordance with the manufacturer's instructions and the requirements for labeling with the critical level not less than 1 inch (25 mm) above the flood level rim.

**608.15.4.2 Hose connections.** Sillcocks, hose bibbs, wall hydrants and other openings with a hose connection shall be protected by an atmospheric-type or pressure-type vacuum breaker or a permanently attached hose connection vacuum breaker.

**Exceptions:**

1. This section shall not apply to water heater and boiler drain valves that are provided with hose connection threads and that are intended only for tank or vessel draining.
2. This section shall not apply to water supply valves intended for connection of clothes washing machines where backflow prevention is otherwise provided or is integral with the machine.

**608.16 Connections to the potable water system.** Connections to the potable water system shall conform to Sections 608.16.1 through 608.16.10.

**608.16.1 Beverage dispensers.** The water supply connection to beverage dispensers shall be protected against backflow by a backflow preventer conforming to ASSE 1022 or by an air gap. The portion of the backflow preventer device downstream from the second check valve and the piping downstream therefrom shall not be affected by carbon dioxide gas.

**608.16.2 Connections to boilers.** The potable supply to the boiler shall be equipped with a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CAN/CSA B64.3. Where conditioning chemicals are introduced into the system, the potable water connection shall be protected by an air gap or a reduced pressure principle backflow preventer, complying with ASSE 1013, CAN/CSA B64.4 or AWWA C511.

**608.16.3 Heat exchangers.** Heat exchangers utilizing an essentially toxic transfer fluid shall be separated from the potable water by double-wall

construction. An air gap open to the atmosphere shall be provided between the two walls. Heat exchangers utilizing an essentially nontoxic transfer fluid shall be permitted to be of single-wall construction.

**TABLE 608.15.1  
MINIMUM REQUIRED AIR GAPS**

FIXTURE	MINIMUM AIR GAP	
	Away from a wall <sup>a</sup> (inches)	Close to a wall (inches)
Lavatories and other fixtures with effective opening not greater than 1/2 inch in diameter	1	1 ½
Sink, laundry trays, gooseneck back faucets and other fixtures with effective openings not greater than 3/4 inch in diameter	1 ½	2 ½
Over-rim bath fillers and other fixtures with effective openings not greater than 1 inch in diameter	2	3
Drinking water fountains, single orifice not greater than 7/16 inch in diameter or multiple orifices with a total area of 0.150 square inch (area of circle 7/16 inch in diameter)	1	1 ½
Effective openings greater than 1 inch	Two times the diameter of the effective opening	Three times the diameter of the effective opening

For SI: 1 inch = 25.4 mm.

- a. Applicable where walls or obstructions are spaced from the nearest inside-edge of the spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls.

**608.16.4 Connections to automatic fire sprinkler systems and standpipe systems.** The potable water supply to automatic fire sprinkler and standpipe systems shall be protected against backflow by a double check-valve assembly or a reduced pressure principle backflow preventer.

**Exceptions:**

1. Where systems are installed as a portion of the water distribution system in accordance with the requirements of this code and are not provided with a fire department connection, isolation of the water supply system shall not be required.
2. Isolation of the water distribution system is not required for deluge, preaction or dry pipe systems.

**608.16.4.1 Additives or nonpotable source.** Where systems under continuous pressure contain chemical additives or antifreeze, or where systems are connected to a nonpotable secondary water supply, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer. Where chemical additives or antifreeze are

added to only a portion of an automatic fire sprinkler or standpipe system, the reduced pressure principle backflow preventer shall be permitted to be located so as to isolate that portion of the system. Where systems are not under continuous pressure, the potable water supply shall be protected against backflow by an air gap or a pipe applied atmospheric vacuum breaker conforming to ASSE 1001 or CAN/CSA B64.1.1.

**608.16.5 Connections to lawn irrigation systems.** The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric-type vacuum breaker, a pressure-type vacuum breaker or a reduced pressure principle backflow preventer. A valve shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer.

**608.16.6 Connections subject to backpressure.** Where a potable water connection is made to a nonpotable line, fixture, tank, vat, pump or other equipment subject to backpressure, the potable water connection shall be protected by a reduced pressure principle backflow preventer.

**608.16.7 Chemical dispensers.** Where chemical dispensers connect to the potable water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.13.1, 608.13.2, 608.13.5, 608.13.6, 608.13.8 or 608.13.9.

**608.16.8 Portable cleaning equipment.** Where the portable cleaning equipment connects to the water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.13.1, 608.13.2, 608.13.3, 608.13.7 or 608.13.8.

**608.16.9 Dental pump equipment.** Where dental pumping equipment connects to the water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.13.1, 608.13.2, 608.13.5, 608.13.6 or 608.13.8.

**608.16.10 Coffee machines and noncarbonated beverage dispensers.** The water supply connection to coffee machines and noncarbonated beverage dispensers shall be protected against backflow by a backflow preventer conforming to ASSE 1022 or by an air gap.

**608.17 Protection of individual water supplies.** An individual water supply, *otherwise known as a private water system*, shall be located and constructed so as to be safeguarded against contamination in accordance with *the rules of the "Ohio Department of Health" contained within Chapter 3701-28 of the Administrative Code, "Private Water Systems."*

**608.17.1 Well locations.** *Deleted.*

**TABLE 608.17.1 Deleted.**

**608.17.2 Elevation. Deleted.**

**608.17.3 Depth. Deleted.**

**608.17.4 Water-tight casings. Deleted.**

**608.17.5 Drilled or driven well casings. Deleted.**

**608.17.6 Dug or bored well casings. Deleted.**

**608.17.7 Cover. Deleted.**

**608.17.8 Drainage. Deleted.**

## **SECTION 609 HEALTH CARE PLUMBING**

**609.1 Scope.** This section shall govern those aspects of health care plumbing systems that differ from plumbing systems in other structures. Health care plumbing systems shall conform to the requirements of this section in addition to the other requirements of this code. The provisions of this section shall apply to the special devices and equipment installed and maintained in the following occupancies: nursing homes, homes for the aged, orphanages, infirmaries, first aid stations, psychiatric facilities, clinics, professional offices of dentists and doctors, mortuaries, educational facilities, surgery, dentistry, research and testing laboratories, establishments manufacturing pharmaceutical drugs and medicines, and other structures with similar apparatus and equipment classified as plumbing.

**609.2 Water service.** All hospitals shall have two water service pipes installed in such a manner so as to minimize the potential for an interruption of the supply of water in the event of a water main or water service pipe failure.

**609.3 Hot water.** Hot water shall be provided to supply all of the hospital fixture, kitchen and laundry requirements. Special fixtures and equipment shall have hot water supplied at a temperature specified by the manufacturer. The hot water system shall be installed in accordance with Section 607.

**609.4 Vacuum breaker installation.** Vacuum breakers shall be installed a minimum of 6 inches (152 mm) above the flood level rim of the fixture or device in accordance with Section

The flood level rim of hose connections shall be the maximum height at which any hose is utilized.

**609.5 Prohibited water closet and clinical sink supply.** Jet-or water-supplied orifices, except those supplied by the flush connections, shall not be located in or connected with a water closet bowl or clinical sink. This section shall not prohibit an approved bidet installation.

**609.6 Clinical, hydrotherapeutic and radiological equipment.** All clinical, hydrotherapeutic, radiological or any equipment that is supplied with water or that

discharges to the waste system shall conform to the requirements of this section and Section 608.

**609.7 Condensate drain trap seal.** A water supply shall be provided for cleaning, flushing and resealing the condensate trap, and the trap shall discharge through an air gap in accordance with Section 608.

**609.8 Valve leakage diverter.** Each water sterilizer filled with water through directly connected piping shall be equipped with an approved leakage diverter or bleed line on the water supply control valve to indicate and conduct any leakage of unsterile water away from the sterile zone.

## **SECTION 610 DISINFECTION OF POTABLE WATER SYSTEM**

**610.1 General.** New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to “on-site” or “in-plant” fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.
3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

## **SECTION 611 DRINKING WATER TREATMENT UNITS**

**611.1 Design.** Drinking water treatment units shall meet the requirements of NSF 42, NSF 44, NSF 53 or NSF 62 or CSA B483.1.

**611.2 Reverse osmosis systems.** The discharge from a reverse osmosis drinking water treatment unit shall enter the drainage system through an air gap or an air gap device that meets the requirements of NSF 58 or CSA B483.1.

**611.3 Connection tubing.** The tubing to and from drinking water treatment units shall be of a size and material as recommended by the manufacturer. The tubing shall comply with NSF 14, NSF 42, NSF 44, NSF 53, NSF 58 or NSF 61.

## **SECTION 612 SOLAR SYSTEMS**

**612.1 Solar systems.** The construction, installation, alterations and repair of systems, equipment and appliances intended to utilize solar energy for space heating or cooling, domestic hot water heating, swimming pool heating or process heating shall be in accordance with the *mechanical code*.

## **SECTION 613 TEMPERATURE CONTROL DEVICES AND VALVES**

**613.1 Temperature-actuated mixing valves.** Temperature-actuated mixing valves, which are installed to reduce water temperatures to defined limits, shall comply with ASSE 1017. *Such valves shall be installed at the hot water source.*