

CHAPTER 5

WATER HEATERS

User note:

About this chapter: Chapter 5 contains regulations concerning the safety of water heating units and hot water storage tanks. Heated (hot or tempered) potable water is needed for plumbing fixtures that are associated with handwashing, bathing, culinary activities and building maintenance. Heated water is commonly stored in large pressurized storage tanks that must be protected against explosion by pressure and temperature relief valves specified in this chapter. This chapter also covers the access requirements to water heaters and hot water storage tanks to allow for the maintenance and replacement of that equipment.

SECTION 501 GENERAL

501.1 Scope. The provisions of this chapter shall govern the materials, design and installation of water heaters and the related safety devices and appurtenances.

501.2 Water heater as space heater. Where a combination potable water heating and space heating system requires water for space heating at temperatures higher than 140°F (60°C), a master thermostatic mixing valve complying with ASSE 1017 shall be provided to limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less. ~~Backflow protection shall be required and the~~ The potability of the water shall be maintained throughout the system.

501.3 Drain valves. Drain valves for emptying shall be installed at the bottom of each tank-type water heater and hot water storage tank. Drain valves shall conform to ASSE 1005. ~~The drain valve inlet shall be not less than 1/2 inch (19 mm) nominal iron pipe size and the outlet shall be provided with male garden hose threads.~~

501.4 Location. Water heaters and storage tanks shall be located and connected so as to provide access for observation, maintenance, servicing and replacement. ~~Gas water heaters shall not be installed in bathrooms or bedrooms unless installed in a closet having a weather stripped solid door with an approved door closing device, that has been designed exclusively for the water heater and where all air for combustion and ventilation is supplied from outdoors.~~ [RM12]

501.5 Water heater labeling. All water heaters shall be third-party certified.

501.6 Water temperature control in piping from tankless heaters. The temperature of water from tankless water heaters shall be a maximum of 140°F (60°C) when intended for domestic uses. This provision shall not supersede the requirement for protective shower valves in accordance with Section 424.3.412.3

501.7 Pressure marking of storage tanks. Storage tanks and water heaters installed for domestic hot water shall have the maximum allowable working pressure clearly and indelibly stamped in the metal or marked on a plate welded thereto or

otherwise permanently attached. Such markings shall be in an accessible-a position with access on the outside of the tank so as to make inspection or reinspection readily possible.

501.8 Temperature controls. All-hHot water supply systems shall be equipped with automatic temperature controls capable of adjustments from the lowest to the highest acceptable temperature settings for the intended temperature operating range.

SECTION 502 INSTALLATION

502.1 General. Water heaters shall be installed in accordance with the manufacturer's installation instructions. Oil-fired water heaters shall conform to the requirements of this code and the *Arkansas Mechanical Code*. Electric water heaters shall conform to the requirements of this code and provisions of ~~the NFPA 70.e~~ *National Electrical Code* listed in Chapter 13. Gas-fired water heaters shall conform to the requirements of this code and the *Arkansas Fuel Gas Code*. Thermal expansion tanks [RM13] or approved thermal expansion relief devices shall be required on water heaters where thermal expansion can be considered a problem due to restrictions. [RM14]

502.1.1 Elevation and protection. Elevation of water heater ignition sources and mechanical damage protection requirements for water heaters shall be in accordance with the *Arkansas Mechanical Code* and the *Arkansas Fuel Gas Code*.

502.2 Rooms used as a plenum. Water heaters using solid, liquid or gas fuel shall not be installed in a room containing air-handling machinery when such room is used as a plenum.

~~502.2.1 Water heaters installed in garages. Water heaters having an ignition source shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the garage floor unless listed as flammable vapor ignition resistant.~~

502.3 Water heaters installed in attics. Attics containing water heaters requiring access shall be provided with an opening and unobstructed passageway large enough to allow removal of the largest component of the water heater. The

passageway shall not be less than 30 inches (762 mm) ~~high in height from the top of the walkway~~ and 22 inches (559 mm) ~~wide in width~~ and not more than 20 feet (6096 mm) in length when measured along the centerline of the passageway from the opening to the ~~equipment~~ water heater. The passageway shall have continuous solid flooring not less than 24 inches (610 mm) ~~in width wide~~. A level service space not less than ~~30 36 inches (762 914.4 mm) in length deep~~ and ~~30 36 inches (762 914.4 mm) in width wide~~ shall be present at the front ~~or service~~ side of the water heater. The clear access opening dimensions shall be a minimum of 20 inches by ~~30 36 inches (508 mm by 762 914.4 mm)~~ where such dimensions are large enough to allow removal ~~of the largest component~~ of the water heater.

Exceptions:

~~The passageway and level service space are not required where the water heater is capable of being serviced and removed through the required opening.~~

~~Where the passageway is not less than 6 feet (1829 mm) high for its entire length, the passageway shall be not greater than 50 feet (15 250 mm) in length.~~

502.4 Seismic supports. Where earthquake loads are applicable in accordance with the *Arkansas Fire Prevention Code*, water heater supports shall be designed and installed for the seismic forces in accordance with the *Arkansas Fire Prevention Code*, the *Arkansas Gas Code* and *National Electrical Code*.

502.5 Clearances for maintenance and replacement. ~~Appliances shall be provided with access for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space not less than 30 inches in length and 30 inches in width (762 mm by 762 mm) shall be provided in front of the control side to service an appliance.~~

SECTION 503 CONNECTIONS

503.1 Cold water line valve. The cold water supply line size to each hot water storage tank or water heater shall be ~~a minimum of 3/4 inch (19.1 mm) inside diameter in accordance with the manufacturer's installation instructions.~~ The cold water branch line from the main water supply line to each hot water storage tank or water heater shall be provided with a valve, located near the equipment and serving only the hot water storage tank or water heater. The valve shall not interfere or cause a disruption of the cold water supply to the remainder of the cold water system. The valve shall be provided with access on the same floor level as the water heater served. ~~Approved plastic water distribution may be used for The the cold and hot water supply lines but six inches of metallic pipe shall be used to connect directly be connected to the water heater. On gas fired water heaters the plastic piping shall maintain a minimum clearance of~~

~~six inches from the flue pipe with approved water heater copper flex connectors.~~

503.2 Water circulation. The method of connecting a circulating water heater to the tank shall provide proper circulation of water through the water heater. The pipe or tubes required for the installation of appliances that will draw from the water heater or storage tank shall comply with the provisions of this code for material and installation.

SECTION 504 SAFETY DEVICES

504.1 Antisiphon devices. An approved means, such as a cold water "dip" tube with a hole at the top or a vacuum relief valve installed in the cold water supply line above the top of the heater or tank, shall be provided to prevent siphoning of any storage water heater or tank.

504.2 Vacuum relief valve. Bottom fed water heaters and bottom fed tanks connected to water heaters shall have a vacuum relief valve installed. The vacuum relief valve shall comply with ANSI Z21.22.

504.3 Shutdown. A means for disconnecting an electric hot water supply system from its energy supply shall be provided in accordance with the ~~NFPA 70 National Electrical Code~~. A separate valve shall be provided to shut off the energy fuel supply to all other types of hot water supply systems.

504.4 Relief valve. ~~All s~~ Storage water heaters operating above atmospheric pressure shall be provided with an approved, self-closing (levered) pressure relief valve and temperature relief valve or combination thereof. The relief valve shall conform to ANSI Z21.22. The relief valve shall not be used as a means of controlling thermal expansion. ~~(Tankless water heaters do not require a pressure and temperature relief valve.)~~

504.4.1 Installation. Such valves shall be installed in the shell of the water heater tank. Temperature relief valves shall be so located in the tank as to be actuated by the water in the top 6 inches (152 mm) of the tank served. For installations with separate storage tanks, ~~the approved, self-closing (levered) pressure relief valve and temperature relief valve or combination thereof conforming to ANSI Z21.22 valves shall be installed on both the storage water heater and storage tank. the valves shall be installed on the tank and there shall not be any type of valve installed between the water heater and the storage tank.~~ There shall not be a check valve or shutoff valve between a relief valve and the heater or tank served.

504.5 Relief valve approval. Temperature and pressure relief valves, or combinations thereof, and energy cutoff devices shall bear the label of an approved agency and shall have a temperature setting of not more than 210°F (99°C) and a pressure setting not exceeding the tank or water heater manufacturer's rated working pressure or 150 psi (1035 kPa), whichever is less. The relieving capacity of each pressure relief valve

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and each temperature relief valve shall equal or exceed the heat input to the water heater or storage tank.

~~504.6 Relief outlet waste.~~ The outlet of a pressure, temperature or other relief valve shall not be directly connected to the drainage system.

~~504.6.1 Discharge.~~ The relief valve shall discharge full size to outside the building or to an indirect waste receptor by means of an air gap. The discharge pipe shall not have any trapped sections. The outlet end of the discharge pipe shall not be threaded and such discharge pipe shall not have a valve or tee installed. Relief valve piping shall be piped independent of other equipment drains or relief valve discharge piping to the disposal point. Such pipe shall be installed in a manner that does not cause personal injury to occupants in the immediate area or structural damage to the building.

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

Not be directly connected to the drainage system.

Discharge through an air gap located in the same room as the water heater.

Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.

4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.

Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.

Discharge in a manner that does not cause personal injury or structural damage.

Discharge to a termination point that is readily observable by the building occupants.

Not be trapped.

Be installed so as to flow by gravity.

Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or flood level rim of the waste receptor.

Not have a threaded connection at the end of such piping.

Not have valves or tee fittings.

Be constructed of those materials listed in Section 605.4 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with

insert fittings. The outlet end of such tubing shall be fastened in place

~~504.6.2 Materials.~~ Relief valve discharge piping shall be of those materials listed in Section 605.4 or shall be tested, rated and approved for such use in accordance with ASME A112.4.1. Piping from safety pan drains shall be of those materials listed in Table 605.4.

504.7 Require pan. Where a storage tank-type water heaters or hot water storage tanks ~~is are~~ installed in a locations where water leakage of the tanks or connections will cause damage, the tank or water heater shall be installed in a pan constructed of one of the following: galvanized steel pan having a material minimum thickness of not less than 0.0236 inch (0.6010 mm) 24 gage, or other pans approved for such use.

Galvanized steel or aluminum of not less than 0.0236 inch (0.6010 mm) in thickness.

Plastic not less than 0.036 inch (0.9 mm) in thickness.

Other approved materials.

A plastic pan shall not be installed beneath a gas-fired water heater.

504.7.1 Pan size and drain. The pan shall be not less than 1 ~~1/2~~ inches (38 mm) in depth and deep and shall be of sufficient size and shape to receive all dripping or condensate from the tank or water heater. The pan shall be drained by an indirect waste pipe having a minimum diameter of 3/4 inch (19 mm). Piping for safety pan drains shall be of those materials listed in Table 605.3.

504.7.2 Pan drain termination. The pan drain shall extend full-size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate not less than 6 inches (152 mm) and not more than 24 inches (610 mm) above the adjacent ground surface. Where a pan drain was not previously installed, a pan drain shall not be required for a replacement water heater installation.

SECTION 505 INSULATION

~~505.1 Unfired vessel insulation.~~ Unfired hot water storage tanks shall be insulated to R-12.5 (h · ft² · °F)/Btu (R-2.2 m² · K/W), so that heat loss is limited to a maximum of 15 British thermal units per hour (Btu/h) per square foot (47 W/m²) of external tank surface area. For purposes of determining this heat loss, the design ambient temperature shall not be higher than 65°F (18°C).

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CHAPTER 6

WATER SUPPLY AND DISTRIBUTION

User note:

About this chapter: Many plumbing fixtures require a supply of potable water. Other fixtures could be supplied with nonpotable water such as reclaimed water. Chapter 6 covers the requirements for water distribution piping systems to and within buildings. The regulations include the types of materials and the connection methods for such systems. The prevention of backflow of contaminated or polluted water into any potable water system is critical for protection of users of potable water. This chapter regulates the assemblies, devices and methods that are used for this purpose.

SECTION 601 GENERAL

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

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.

601.5 Rehabilitation of piping systems. Where pressure piping systems are rehabilitated using an epoxy lining system, such lining system shall comply with ASTM F 2831.

SECTION 602 WATER REQUIRED

602.1 General. ~~Every~~ Structures 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. Where a potable public water supply is not available, individual sources of potable water supply shall be utilized.

602.3.1 Sources. Dependent on geological and soil conditions and the amount of rainfall, individual water supplies

are of the following types: drilled well, driven well, dug well, bored well, spring, stream or cistern. Surface bodies of water and land cisterns shall not be sources of individual water supply unless properly treated by approved means to prevent contamination. Individual water supplies shall be constructed and installed in accordance with the applicable state and local laws. Where such laws do not address all of the requirements set forth in NGWA-01, individual water supplies shall comply with NGWA-01 for those requirements not addressed by state and local laws.

602.3.2 Minimum quantity. The combined capacity of the source and storage in an individual water supply system shall supply the fixtures with water at rates and pressures as required by this chapter.

602.3.3 Water quality. Water from an individual water supply shall be approved as potable by the authority having jurisdiction prior to connection to the plumbing system.

602.3.4 Disinfection of system. After construction or ~~major~~ repair, the individual water supply system shall be purged of deleterious matter and disinfected in accordance with Section 610.

602.3.5 Pumps. Pumps shall be rated for the transport of potable water. Pumps in an individual water supply system shall be constructed and installed so as to prevent contamination from entering a potable water supply through the pump units. Pumps shall be sealed to the well casing or covered with a water-tight seal. Pumps shall be designed to maintain a prime and installed such that ready access is provided to the pump parts of the entire assembly for repairs.

602.3.5.1 Pump enclosure. The pump room or enclosure around a well pump shall be drained and protected from freezing by heating or other approved means. Where pumps are installed in basements, such pumps shall be mounted on a block or shelf not less than 18 inches (457 mm) above the basement floor. Well pits shall be prohibited.

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 not less than $\frac{3}{4}$ inch (19.1 mm) in diameter.

603.2 Separation of water service and building sewer.

Where water service piping is located in the same trench with the *building sewer*, such *sewer* shall be constructed of materials listed in Table 702.2. Where the *building sewer* piping is not constructed of materials listed in Table 702.2, the water service pipe and the *building sewer* shall be horizontally separated by not less than 5 feet (1524 mm) of undisturbed or compacted earth. The required separation distance shall not apply where a water service pipe crosses a *sewer* pipe, provided the water service is sleeved to a point not less than 5 feet (1524 mm) horizontally from the *sewer* pipe centerline on both sides of such crossing. The sleeve shall be of pipe materials listed in Table 605.3, 702.2 or 702.3. The required separation distance shall not apply where the bottom of the water service pipe, located within 5 feet (1524 mm) of the *sewer*, is not less than 12 inches (305 mm) above the highest point of the top of the *building sewer*.

~~603.2 Separation of water service and building sewer.~~ Water service pipe and the building sewer shall be separated by 10 feet (3048 mm) of undisturbed or compacted earth.

Exceptions:

~~The required separation distance shall not apply where the bottom of the water service pipe within 10 feet (3048 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.~~

~~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 10 feet (1524 mm) horizontally from the sewer pipe centerline, on both sides of such crossing with pipe materials listed in Table 605.3, Table 702.2 or Table 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. Where soil or ground water causes contaminated conditions for piping, analysis shall be required in accordance with Section 605.1 (see Section 605.1 for soil and groundwater conditions).

~~603.2.2 Separate ditch for water.~~ Except as provided in 603.2 of this code, water lines shall be installed in separate trenches. In no case shall electrical lines, TV cable lines or gas lines be installed in the same trench with water or sewer unless approved by the State Administrative Authority. [A15]

~~603.2.3 Individual water.~~ Except as approved by the State Administrative Authority, in no case shall a residential building be allowed to connect to the same water, building drain or building sewer service of another private residential building. Each building structure shall have separate water, and/or water line service from the point of the utility source and in no case be interconnected with the plumbing system of another privately owned property.

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.

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:

Blowout design water closets having a water consumption not greater than [3.5 gallons (13 L) per flushing cycle].

Vegetable sprays.

Clinical sinks having a water consumption not greater than [4.5 gallons (17 L) per flushing cycle].

Service sinks.

Emergency showers.

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 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

604.8 Water-pressure reducing valve or regulator. Where water pressure within a building exceeds 80-75 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 ~~80.75~~ 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 ~~80.75~~ 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.

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

FIXTURE SUPPLY OUTLET SERVING	FLOW RATE ^a	FLOW PRESSURE
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	8 <u>20</u>
Bidet, thermostatic mixing valve	2	4 <u>20</u>
Combination fixture	4	8
Dishwasher, residential	2.75	8
Drinking fountain	0.75	8
Laundry tray	4	8
Lavatory, private	0.8	8
Lavatory, private, mixing valve	0.8	8
Lavatory, public	20.4	8
Shower	32.5	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve temperature controlled	32.5 ^b	20
Sillcock, hose bibb	5	8
Sink, residential	2.5 <u>1.75</u>	8
Sink, service	3	8
Urinal, valve	15	45 <u>25</u>
Water closet, blow out, flushometer valve	35 <u>25</u>	25 <u>45</u>
Water closet, flushometer tank	1.6	45 <u>20</u>

Water closet, siphonic, flushometer valve	25	45 <u>35</u>
Water closet, tank, close coupled	3	8 <u>20</u>
Water closet, tank, one piece	6	20

For SI: 1 pound per square inch = 6.895 kPa,
gallon per minute = 3.785 L/m.

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

[b. Where the shower mixing valve manufacturer indicates a lower flow rating for the mixing valve, the lower value shall be applied.](#)

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

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY ^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 ^a	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 hand-held shower spray is a shower head.

Consumption tolerances shall be determined from referenced standards.

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.

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.

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~~ 412.3.

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.

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

FIXTURE	MINIMUM PIPE SIZE (inch)
Bathtubs ^a (60" x 32" and smaller)	1/2
Bathtubs ^a (larger than 60" x 32")	1/2
Bidet	3/8
Combination sink and tray	1/2
Dishwasher, domestic ^a	1/2
Drinking fountain	3/8
Hose bibbs	1/2
Kitchen sink ^a	1/2
Laundry, 1, 2 or 3 compartments ^a	1/2
Lavatory	3/8
Shower, single head ^a	1/2
Sinks, flushing rim	3/4
Sinks, service	1/2
Urinal, flush tank	1/2
Urinal, flush valve	3/4
Wall hydrant	1/2
Water closet, flush tank or flushometer tank	3/8
Water closet, flush valve	1
Water closet, flushometer tank	3/8
Water closet, one piece ^a	1/2

For S 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 5060 feet or less, and the available pressure at the meter is a minimum of 35 psi or greater, 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.

**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
1/2	2	5
3/4	6	11
1	10	20
1 1/4	15	31
1 1/2	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.

605.2 Lead content of water supply pipe and fittings. Pipe and pipe fittings, including valves and faucets, utilized in the water supply system shall have a maximum of 0.25-percent lead content. ~~(See Section 615)~~

~~615.1~~**605.2.1 Lead content of water supply pipe and fittings.** Pipe and pipe fittings, including valves and faucets, utilized in the plumbing water supply system shall have a maximum of 0.25 percent lead content when used with respect to the wetted surfaces of pipe, pipe fittings, plumbing fittings, and fixtures.

~~615.2~~**605.2.2 Calculations.** The weighted average lead content of a pipe, pipe fitting, plumbing fitting, or fixture shall be calculated by using the following formula: For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with 605.2 and 615.1. For lead content of materials that are provided as a range, the maximum content of the range shall be used.

~~615.3~~**605.2.3 Exemptions.** The prohibitions in 605.2 and this section shall not apply to pipes, pipe fittings, plumbing fittings, or fixtures, including backflow preventers, that are used exclusively for nonpotable services such as manufacturing, industrial processing, irrigation, outdoor watering, toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves or any other uses where the water is not anticipated to be used for human consumption.

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 w~~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 rating not less than equal to the highest available pressure. ~~Plastic w~~Water service piping materials not third-party certified for water distribution pipe shall terminate no closer than 30 inches (762 mm) outside of an exterior wall or slab on grade at or before the full open valve located at the entrance of the structure. All ductile iron water service piping shall be cement mortar lined in accordance with AWWA C104/A21.4.

605.3.1 Dual check-valve-type backflow preventer. ~~Where a d~~ Dual check-valve backflow preventers ~~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 and tubing shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.4. ~~All h~~ Hot water distribution pipe and tubing shall have a ~~minimum~~ pressure rating of not less than 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 e~~conform to~~ the respective pipe standards or one of the applicable standards listed in Table 605.5. ~~All p~~ Pipe fittings utilized in water supply systems shall also e~~conform to comply with~~ NSF 61. ~~The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow in the piping.~~ Ductile and gray iron pipe fittings utilized in water service piping systems shall be cement mortar lined in accordance with AWWA C104/A21.4.

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 ~~/ serving as a~~ 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 1/4"0.25-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 v~~ Valves shall be ~~of an approved type and~~ compatible with the type of piping material installed in the system. Valves shall conform to one of the standards listed in Table 605.7 or shall be approved. ~~Ball valves, gate valves, globe valves and plug v~~ Valves intended to

supply drinking water shall meet the requirements of NSF 61.

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, copper <u>alloy</u> -, 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:

Cement or concrete joints.

Joints made with fittings not approved for the specific installation.

Solvent-cement joints between different types of plastic pipe.

Saddle-type fittings.

Joints and connections under slab are prohibited in water supply and distribution installations unless made by low heat welding, such as silfos, or low heat rod welding. Flange connections may be used in ductile iron piping installations.

**TABLE 605.3
WATER SERVICE PIPE**

MATERIAL	STANDARD
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
Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC)	ASTM F 2855
Copper or copper-alloy pipe (Brass)	ASTM B 42; ASTM B 302; ASTM B 43
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM) ^a	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 447
Cross-linked polyethylene (PEX) plastic tubing	ASTM F 876; ASTM F 877; AWWA C904; CSA B137.5; NSF-14 / NSF 61
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F 1281; ASTM F 2262; CSA B137.10M
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986
Ductile iron water pipe	AWWA C151/A21.51; AWWA C115/A21.15
Galvanized steel pipe	ASTM A 53
Polybutylene (PB) plastic pipe and tubing	ASTM D 2663; ASTM D 2666; ASTM D 3309; CSA B137.8M
Polyethylene (PE) plastic pipe	ASTM D 2239; ASTM D 3035; AWWA C901; CSA B137.11
Polyethylene (PE) plastic tubing	ASTM D 2737; AWWA C901; CSA B137.1
Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	ASTM F 1282; CSA B137.9
Polyethylene of raised temperature (PE-RT) plastic tubing	ASTM F 2769; CSA B137.18
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

a. M or WM shall not be installed below concrete.

**TABLE 605.4
WATER DISTRIBUTION PIPE**

MATERIAL	STANDARD
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
Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC)	ASTM F 2855
Copper or copper-alloy pipe (Brass)	ASTM B 42; ASTM B 302; ASTM B 43
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM) ^a	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 447
Cross-linked polyethylene (PEX) plastic tubing	ASTM F 876; ASTM F 877; NSF-14 / NSF 61; CSA B137.5
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F 1281; ASTM F 2262; 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
Polybutylene (PB) plastic pipe and tubing	ASTM D 3309; CSA B137.8M
Polyethylene/Aluminum/Polyethylene (PE-AL-PE) composite pipe	ASTM F 1282
Polyethylene of raised temperature (PE-RT) plastic tubing	ASTM F 2769
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

a. M or WM shall not be installed below concrete.

**TABLE 605.5
PIPE FITTINGS**

MATERIAL	STANDARD
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	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23 ; ASME B16.26; ASME B16.29; 51 ; ASSE 1061 ; ASTM F1476 ; ASTM F1548
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986
Fittings for cross-linked polyethylene (PEX) plastic tubing	ASTM F 877; ASTM F 1807; ASTM F 1960; ASTM F 2080; ASTM F 2159; CSA B137.5 ASSE 1061 ; ASTM F 877 ; ASTM F 1807 ; ASTM F 1960 ; ASTM F 2080 ; ASTM F 2098 ; ASTM F 2159 ; ASTM F 2434 ; ASTM F 2735 ; CSA B137.5
Fittings for polyethylene of raised temperature (PE-RT) plastic tubing	ASTM F 1807; ASTM F 2098; ASTM F 2159; ASTM F 2735; ASTM F 2769; CSA B137.18
Gray iron and ductile iron	AWWA C110; AWWA C153 ; ASTM F 1476; ASTM F 1548 ; AWWA C110/A21.10; AWWA C153/A21.53
Insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F1974; ASTM F1281; ASTM F1282; CSA B137.9; CSA B137.10
Malleable iron	ASME B16.3
Metal (brass) insert fittings for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) and Cross-linked Polyethylene/Aluminum/Polyethylene (PEX-AL-PEX)	ASTM F 1974
Polybutylene (PB) plastic	CSA B137.8
Polyethylene (PE) plastic	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; ASTM F 1476 ; ASTM F 1548
Stainless steel (Type 316/316L)	ASTM A 312; ASTM A 778; ASTM F 1476 ; ASTM F 1548
Steel	ASME B16.9; ASME B16.11; ASME B16.28; ASTM F 1476 ; ASTM F 1548

**TABLE 605.7
VALVES**

MATERIAL	STANDARD
Chlorinated polyvinyl chloride (CPVC) plastic	ASME A112.4.14; ASME A112.18.1/CSA B125.1; ASTM F1970; CSA B125.3; IAPMO Z1157; MSS SP-122
Copper or copper alloy	ASME A112.4.14; ASME A112.18.1/CSA B125.1; ASME B16.34; CSA B125.3; MSS SP-67; MSS SP-80; MSS SP-110; IAPMO Z1157; MSS SP-139
Cross-linked polyethylene (PEX) plastic	ASME A112.4.14; ASME A112.18.1/CSA B125.1; CSA B125.3; NSF 359; IAPMO Z1157
Gray iron and ductile iron	AWWA C500; AWWA C504; AWWA C507; MSS SP-67; MSS SP-70; MSS SP-71; MSS SP-72; MSS SP-78; IAPMO Z1157
Polypropylene (PP) plastic	ASME A112.4.14; ASTM F2389; IAPMO Z1157
Polyvinyl chloride (PVC) plastic	ASME A112.4.14; ASTM F1970; IAPMO Z1157; MSS SP-122

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. Where pipe is to be threaded, the pipe

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shall have a wall thickness of not less than Schedule 80. Schedule 80 or heavier pipe shall be permitted to be threaded. Pipe threads shall be made 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 605.112.1 through 605.112.4.~~

~~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.~~

605.11 13 Gray iron and ductile iron joints. Joints for gray and ductile iron pipe and fittings shall comply with AWWA C111/A21.11 and shall be installed in accordance with the manufacturer's installation instructions.

605.12 14 Copper pipe. Joints between copper or copper-alloy pipe or fittings shall comply with Sections 605.124.1 through 605.124.5.

605.12 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.

605.12 14.2 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.12 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.

605.12 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.

605.12 14.5 Welded joints. All joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.

605.13 15 Copper tubing. Joints between copper or copper-alloy tubing or fittings shall comply with Sections 605.1415.1 through 605.1415.64.

605.13 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.

605.13 15.2 Flared joints. Flared joints for water pipe shall be made by a tool designed for that operation.

605.13.3 Grooved and shouldered mechanical joints. Grooved and shouldered mechanical joints shall comply with ASTM F 1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed

605.1315.43 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.13.5 Press-connect joints. Press-connect joints shall conform to one of the standards listed in Table 605.5, and shall be installed in accordance with the manufacturer's instructions. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. The tube shall be fully inserted into the press-connect fitting. Press-connect joints shall be pressed with a tool certified by the manufacturer.

605.1315.64 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.

605.13.7 Push-fit joints. Push-fit joints shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.14 16 CPVC plastic. Joints between CPVC plastic pipe or fittings shall comply with Sections 605.14 16.1 through 605.14 16.3.

605.14 16.1 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.14 16.2 Solvent cementing. Joint surfaces shall be clean and free from moisture, and an approved primer shall be applied. Joints shall be made in accordance with the pipe manufacturer's installation instructions. Where such instructions require that a primer be used, the primer shall be applied to the joint surfaces and a solvent cement orange in color and conforming to ASTM F 493 shall be applied to the joint surfaces. Where such instructions allow for a one-step solvent cement, yellow in color and conforming to

ASTM F 493, to be used, the joint surfaces shall not require application of a primer before the solvent cement is 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:

The solvent cement used is third-party certified as conforming to ASTM F 493.

The solvent cement used is yellow in color.

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.

The CPVC pipe and fittings are manufactured in accordance with ASTM D 2846.

605.14.16.3 Threaded joints. Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Schedule 80 or heavier pipe shall be permitted to be threaded. Pipe threads shall be made 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.

605.14.4 Push-fit joints. Push-fit joints shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.15 Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) pipe and tubing. Joints between CPVC/AL/CPVC plastic pipe or CPVC fittings shall comply with Sections 605.15.1 and 605.15.2.

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

605.15.2 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 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.

The solvent cement used is yellow in color.

The solvent cement is used only for joining $\frac{1}{2}$ -inch (12.7 mm) through 2-inch-diameter (51 mm) CPVC/AL/CPVC pipe and CPVC fittings.

The CPVC fittings are manufactured in accordance with ASTM D 2846.

605.17-16 PEX 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. Fittings for cross-linked polyethylene (PEX) plastic tubing as described in ASTM F 877, ASTM F 1807, ASTM F 1960, and ASTM F 2980 shall be installed in accordance with the manufacturer's instructions.

605.16.3 Push-fit joints. Push-fit joints shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.18-17 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.

605.17.3 Grooved and shouldered mechanical joints. Grooved and shouldered mechanical joints shall comply with ASTM F 1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.19 Polybutylene plastic. Joints between polybutylene plastic pipe and tubing or fittings shall comply with Sections 605.19.1 through 605.19.3.

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

605.19.2 Heat fusion joints. Joints shall be of the socket fusion or butt fusion type. 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, ASTM D 3309 or CAN3-B137.8M.

605.19.3 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions. Metallic lock rings employed with insert fittings as described in ASTM D 3309 or CAN3-B137.8M shall be

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~~installed in accordance with the manufacturer's instructions.~~

605.1820 PE Polyethylene plastic. Joints between polyethylene plastic pipe and tubing or fittings shall comply with Sections 605.1820.1 through 605.1820.4.

605.18 20.1 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.

605.18 20.2 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.

605.18 20.3 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.18 20.4 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.

605.1921 Polypropylene (PP) plastic. Joints between PP plastic pipe and fittings shall comply with Section 605.1921.1 or 605.1921.2.

605.19 21.1 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.

605.19 21.2 Mechanical and compression sleeve joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.

605.20 Polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX). Joints between PE-AL-PE or PEX-AL-PEX pipe and fittings shall comply with Section 605.20.1.

605.20.1 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, CSA B137.9 and CSA B137.10 shall be installed in accordance with the manufacturer's instructions.

605.22-21 PVC plastic. Joints between PVC plastic pipe or fittings shall comply with Sections 605.2221.1 through 605.2221.43.

605.2221.1 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.

605.21.2 Grooved and shouldered mechanical joints. Grooved and shouldered mechanical joints shall comply with ASTM F 1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.2221.32 Solvent cementing. Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and 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.

605.2221.43 Threaded joints.

Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Schedule 80 or heavier pipe shall be permitted to be threaded. Pipe threads shall be made with dies specifically designed for plastic pipe., ~~but the~~ 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.

605.23-22 Stainless steel. Joints between stainless steel pipe and fittings shall comply with Sections 605.2322.1 and 605.2322.32.

605.2322.1 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.2322.2 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.

605.22.3 Grooved and shouldered mechanical joints. Grooved and shouldered mechanical joints shall comply with ASTM F 1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.24-23 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 605.2423.1, 605.2423.2 and 605.2423.3. 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.

605.2423.1 Copper or copper-alloy tubing to galvanized steel pipe. Joints between copper pipe or ~~copper-alloy~~ tubing and galvanized steel pipe shall be made with a ~~brass fitting-copper alloy~~ 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.

605.2423.2 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 or transition fittings~~.

605.2423.3 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~~.

605.24 PE-RT plastic. Joints between polyethylene of raised temperature plastic tubing and fittings shall be in accordance with Section 605.24.1.

605.24.1 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:

On the building water service pipe from the public water supply near the curb: ~~if no meter is present~~.

On the water distribution supply pipe at the entrance into the structure.

~~3. On the discharge side of every water meter.~~

~~43.~~ On the base of every water riser pipe in occupancies other than multiple-family residential occupancies that are two stories or less in height and in one- and two-family residential occupancies.

~~54.~~ On the top of every water down-feed pipe in occupancies other than one- and two-family residential occupancies.

~~65.~~ On the entrance to every water supply pipe to a dwelling unit, except where supplying a single fixture equipped with individual stops.

~~76.~~ On the water supply pipe to a gravity or pressurized water tank.

~~87.~~ On the water supply pipe to every water heater.

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

On the fixture supply to each plumbing fixture other than bathtubs and showers in one- and two-family residential occupancies, and other than in individual sleeping units that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies. ~~Exclusions do not apply to bathtubs and showers connected with flexible supply lines~~ ~~A16~~

On the water supply pipe to each sillcock, ~~excluding private residential dwellings~~.

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. ~~Pipe fittings installed for water distribution and water service pipe shall have a minimum ID of 80% of inside pipe diameter.~~

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 *Arkansas Fire Prevention 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 A-~~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 ~~0.25~~¹/₄-inch (6.4 mm) hardware cloth or shall terminate in a horizontal angle seat check

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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
50 - 150	2½
150 - 200	3
200 - 400	4
400 - 700	5
700 - 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. A low-pressure cutoff 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.

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.

**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	1½
1,501 to 3,000	2
3,001 to 5,000	2½
5,000 to 7,500	3
Over 7,500	4

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

606.5.7 Tank drain pipes. A valved drain pipe with a valve 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.

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 0.50 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.

606.7 Labeling of water distribution pipes in bundles. Where water distribution piping is bundled at installation, each pipe in the bundle shall be identified using stenciling or commercially available pipe labels. The identification shall indicate the pipe contents and the direction of flow in the pipe. The interval of the identification markings on the pipe shall not exceed 25 feet (7620 mm). There shall be not less than one identification label on each pipe in each room, space or story.

606.8 Dead Ends. In the installation or removal of any part of the water distribution system, dead ends shall be prohibited.

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 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.

607.1.2 Tempered water temperature control. Tempered water shall be supplied through a water temperature limiting device that conforms to ASSE 1070/ASMEA112.1070/CSA B125.70 and shall limit the tempered water to not greater than 110°F (43°C). This

provision shall not supersede the requirement for protective shower valves in accordance with Section 412.3.

607.2 Hot or tempered water supply to fixtures temperature maintenance. ~~Where the developed length of hot or tempered water piping from the source of hot water supply to the farthest fixtures that require hot or tempered water shall not exceed 100 feet (30 480 mm), [A17] the hot water supply system shall be provided with a method of maintaining the temperature in accordance with the Arkansas Energy Conservation Code. Recirculating system piping and heat-traced piping shall be considered to be sources of hot or tempered water.~~

607.2.1 Piping insulation. Circulating hot water system piping shall be insulated in accordance with the *Arkansas Energy Conservation Code* [RM18].

607.2.1.12 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 **607.2.2 Piping for recirculation systems having master thermostatic valves.** 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. ~~Where a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer, a thermal expansion tank or approved thermal expansion relief devices shall be connected to the water heater cold water supply pipe at a point that is downstream of all check valves, pressure reducing valves and backflow preventers. Thermal expansion tanks or approved thermal expansion relief devices shall be sized in accordance with the tank manufacturer's instructions and shall be sized such that the pressure in the water distribution system shall not exceed that required by Section 604.8.~~

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 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/ *ASME A112.1016/CSA B125.16* or *ASME A112.18.1/CSA B125.1*, or *CSA B125*, where the flow of hot water corresponds to the markings on the device.

~~**607.5 Hot to dishwashing machines.** Dishwashing machines, or similar dishwashing equipment not in private living quarters or dwelling units, shall be provided with water at 180 F (82 C) and not more than 194 F (90 C).~~

SECTION 608 PROTECTION OF POTABLE WATER SUPPLY

608.1 General. A potable water supply system 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 potable water supply through cross-connections or any other piping connections to the system. Backflow preventer applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.4 ~~617.10~~.

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/CSA B125.1*.

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 those connect to the water supply system, shall be provided with protection against backflow and contamination of the water supply system. ~~Water 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 assembly, an atmospheric or spill-resistant 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 Potable water handling and treatment equipment. Water pumps, filters, softeners, tanks and other appliances and devices that handle or treat potable water to be supplied

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to the potable water distribution system shall be located to prevent contamination from entering the appliances and devices. Overflow, relief valve and waste discharge pipes from such appliances and devices shall terminate through an air gap.

608.4-5 Water service piping. Water service piping shall be protected in accordance with Sections 603.2 and 603.2.1.

608.5-6 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.

608.6-7 Cross-connection control. Cross connections shall be prohibited, except where approved backflow prevention assemblies, protective backflow prevention devices or other means or methods are installed to protect the potable water supply.

608.6-71 Private water supplies. Cross connections between a private water supply and a potable public supply shall be prohibited.

608.87 Valves and outlets ~~Stop and waste valves prohibited below grade.~~ Potable water outlets and ~~Combination stop-and-waste valves or cocks~~ shall not be installed underground, or below grade. A freezeproof yard hydrant that drains the riser into the ground shall be considered as having a stop-and-waste valve below grade.

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 Sections 608.14.2, 608.14.5, 607.14.7 or 608.14.9.

608.98 Identification of ~~potable and nonpotable water.~~ ~~In all buildings where two or more water distribution systems, one potable water and the other nonpotable water, systems are installed, the pipe conveying each system the nonpotable water shall be identified either by color marking or metal tags in accordance with Sections 608.89.1-2 through 608.89.2.3.~~

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.~~

608.9.1 DELETED.

608.9.2 Distribution pipe labeling and marking. Nonpotable distribution piping shall be purple in color and shall be embossed, or integrally stamped or marked, with the words: "CAUTION: NONPOTABLE WATER – DO NOT DRINK" or the piping shall be installed with a purple

identification tape or wrap. 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 intervals not exceeding 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.

608.89.2.1 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.

608.89.2.23 Lettering Size. The size of the background color field and lettering shall comply with Table 608.89.32.2.

TABLE 608.89.32.2
SIZE OF PIPE IDENTIFICATION

PIPE DIAMETER (inches)	LENGTH BACKGROUND COLOR FIELD (inches)	SIZE OF LETTERS (inches)
3/4 to 1 1/4	8	0.5
1 1/2 to 2	8	0.75
2 1/2 to 6	12	1.25
8 to 10	24	2.5
over 10	32	3.5

For SI: 1 inch = 25.4 mm.

608.9.2.3 Identification tape. Where used, identification tape shall be at least 3 inches (76 mm) wide and have white or black lettering on a purple field stating "CAUTION: NONPOTABLE WATER – DO NOT DRINK." Identification tape shall be installed on top of nonpotable rainwater distribution pipes, fastened at least every 10 feet (3048 mm) to each pipe length and run continuously the entire length of the pipe.

TABLE 608.4
APPLICATION OF BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD ^a	APPLICATION ^b	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
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes ¹ / ₄ – ³ / ₈ ."	ASSE 1022, CSA B64.3.1
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes ¹ / ₄ – ³ / ₄ ."	ASSE 1012, 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 ¹ / ₄ –1"	ASSE 1024, CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes ¹ / ₂ –1"	ASSE 1052, CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes ¹ / ₂ , ³ / ₄ , 1"	ASSE 1011, 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 ¹ / ₄ –4"	ASSE 1001, CSA B64.1.1
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes ¹ / ₂ –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, 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 ¹ / ₄ –2"	ASSE 1056
Vacuum breaker wall hydrants, frost-resistant, automatic draining type	High or low hazard	Low head backpressure or backsiphonage Sizes ³ / ₄ , 1"	ASSE 1019, CSA B64.2.2

**TABLE 608.1
APPLICATION OF BACKFLOW PREVENTERS**

DEVICE	DEGREE OF HAZARD ^a	APPLICATION ^b	APPLICABLE STANDARDS
Backflow prevention assemblies:			
Double check backflow prevention assembly and double check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes $\frac{3}{8}$ "–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 Sizes 2"–16"	ASSE 1048
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $\frac{1}{2}$ "–2"	ASSE 1020, CSA B64.1.2
Reduced pressure principle backflow prevention assembly and reduced pressure principle fire protection backflow assembly	High or low hazard	Backpressure or backsiphonage Sizes $\frac{3}{8}$ "–16"	ASSE 1013, AWWA C511, 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
Spill-resistant vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $\frac{1}{4}$ "–2"	ASSE 1056; CSA B64.1.3
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ASME A112.1002/ CSA B125.12, CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "– $\frac{3}{4}$ "	ASSE 1022
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{2}$ "– $\frac{3}{4}$ "	ASSE 1012, CSA B64.3
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "–1"	ASSE 1024, CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes $\frac{1}{2}$ "–1"	ASME A112.21.3, ASSE 1052, CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1"	ASME A112.21.3, ASSE 1011, 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 $\frac{1}{4}$ "–4"	ASSE 1001, CSA B64.1.1
Vacuum breaker wall hydrants, frost resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes $\frac{3}{4}$ ", 1"	ASME A112.21.3, ASSE 1019, CSA B64.2.2
Other means or methods:			
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
Barometric loop	High or low hazard	Backsiphonage only	(See Section 608.13.4)

For SI: 1 inch = 25.4 mm.

Low hazard—See Pollution (Section 202).

High hazard—See Contamination (Section 202).

See Backpressure (Section 202).

See Backpressure, low head (Section 202).

See Backsiphonage (Section 202).

608.9-10 Reutilization prohibited. Water utilized for the heating or 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.

608.10-11 Reuse of piping. Piping that has been utilized for any purpose other than conveying potable water shall not be utilized for conveying potable water.

608.11-12 Painting of water tanks. Potable water tanks. Where in contact with potable water intended for drinking water, water tanks, coatings for the inside of tanks and liners for water tanks shall conform to NSF 61. 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.

608.12-13 Pumps and other appliances. Water pumps, filters, softeners, tanks and all other devices that handle or treat potable water shall be protected against contamination.

608.13-14 Backflow protection. Means of protection against backflow shall be provided in accordance with Sections 608.1314.1 through 608.1314.109.

608.1314.1 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. Products that are listed and labeled to ASME A112.1.2 or ASME A112.1.3 shall be considered to be in compliance with this section.

608.1314.2 Reduced pressure principle backflow preventers prevention assemblies. Reduced pressure principle backflow ~~preventers~~ prevention assemblies shall conform to ASSE 1013, AWWA C511, CSA B64.4 or ~~CAN/~~CSA-B64.4.13. 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.

608.1314.3 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.

608.1314.4 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.

608.1314.5 Pressure-type vacuum breakers assemblies. Pressure-type vacuum breakers ~~assemblies~~ shall conform to ASSE 1020 or CSA B64.1.2. Spill-resistant vacuum breaker assemblies shall comply with ASSE 1056 or CSA B64.1.3. and spillproof vacuum breakers shall comply with ASSE 1056. These assemblies shall be installed with the critical level of the assembly located not less than 12 inches (305 mm) above all downstream piping and outlets. 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.

608.1314.6 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 ASME A112.1.3, 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.

608.1314.7 Double check-valve backflow prevention assemblies. Double check-valve backflow prevention assemblies shall conform to ASSE 1015, CSA B64.5, CSA B64.5.1 or AWWA C510. Double-detector fire protection backflow prevention check-valve assemblies shall conform to ASSE 1048. These devices shall be capable of operating under continuous pressure conditions.

608.1314.8 Spillproof vacuum breakers. ~~Spillproof vacuum (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.~~

608.1314.98 Chemical dispenser backflow devices. Backflow devices for chemical dispensers shall comply with ASSE 1055 or shall be equipped with an air gap fitting.

608.14.9 Dual check backflow preventer. Dual check backflow preventers shall conform to ASSE 1024 or CSA B64.6.

608.14-15 Location of backflow preventers. Access shall be provided to backflow preventers as specified by the installation instructions of the approved manufacturer.

608.1415.1 Outdoor enclosures for backflow prevention devices. Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

608.15.2 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.

608.15.2.1 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.

608.15-16 Protection of potable water outlets. All potable water openings and outlets shall be protected against backflow in accordance with Section 608.1516.1, 608.1516.2, 608.1516.3, 608.1516.4, 608.1516.4.1 or 608.1516.4.2 or 608.15.4.3.

608.1516.1 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 608.1516.1. Openings and outlets equipped for hose connection shall be protected by means other than an air gap.

608.1516.2 Protection by a reduced pressure principle backflow prevention assembly-preventer. Openings and outlets shall be protected by a reduced pressure principle backflow-preventer prevention assembly or a reduced pressure principle fire protection backflow prevention assembly on potable water supplies.

608.1516.3 Protection by a backflow preventer with intermediate atmospheric vent. Openings and outlets shall be protected by a backflow preventer with an intermediate atmospheric vent.

608.1516.4 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 425415.3.1. 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.

608.1516.4.1 Deck-mounted and integral vacuum breakers. Approved deck-mounted or equipment-mounted vacuum breakers and faucets with integral atmospheric or spill-resistant 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.

608.1516.4.2 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:

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.

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.

608.16-17 Connections to the potable water system. Connections to the potable water system shall conform to Sections 608.1617.1 through 608.1617.109.

608.1617.1 Beverage dispensers. The water supply connection to carbonated-beverage dispensers shall be protected against backflow in accordance with Sections 608.17.1.1 and 608.17.1.2, by a backflow preventer conforming to ASSE 1022 or by an air gap. The portion of the backflow preventer device downstream of the second check valve and the piping downstream therefrom shall not be affected by carbon dioxide gas.

608.17.1.1 Carbonated beverage dispensers. The water supply connection to each carbonated beverage dispenser 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 of the device and the piping downstream therefrom shall not be affected by carbon dioxide gas.

608.17.1.2 Coffee machines and noncarbonated drink dispensers. The water supply connection to each coffee machine and each noncarbonated beverage dispenser shall be protected against backflow by a backflow preventer conforming to ASSE 1022 or ASSE 1024, or protected by an air gap.

608.1617.2 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.

608.1617.3 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.

608.17.4 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 backflow prevention assembly, a double check fire protection backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly.

Exception:

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.

608.4617.4.1 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 ~~prevention assembly-preventer~~ or a reduced pressure principle fire protection backflow prevention assembly. Where chemical additives or antifreeze are added to only a portion of an automatic fire sprinkler or standpipe system, the reduced pressure principle backflow ~~prevention assembly-preventer~~ or the reduced pressure principle fire protection backflow prevention assembly 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.

608.4617.5 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 ~~prevention assembly-preventer~~. ~~A~~ ~~*Valves~~ 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 ~~prevention assembly-preventer~~.

608.4617.6 Connections subject to backpressure. Where a potable water connection is made to a nonpotable line, fixture, tank, vat, pump or other equipment subject to back-pressure, the potable water connection shall be protected by a reduced pressure principle backflow ~~prevention assembly-preventer~~.

608.4617.7 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 608.4314.1, 608.4314.2, 608.4314.5, 608.4314.6, 608.4314.8 or 608.4314.9

**TABLE 608.4617.1
MINIMUM REQUIRED AIR GAPS**

FIXTURE	MINIMUM AIR GAP	
	Away from a wall ^a (inches)	Close to a wall (inches)
Lavatories and other fixtures with effective opening not greater than 1/2 inch in diameter	1	1 1/2
Sink, laundry trays, gooseneck back faucets and other fixtures with effective openings not greater than 3/4 inch in diameter	1 1/2 1.5	2 1/2 2.5
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 1/2
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.

608.4617.8 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 608.4314.1, 608.4314.2, 608.4314.3, 608.4314.7 or 608.4314.8.

608.4617.9 Dental pump equipment. At the water supply connection to each dental pumping equipment system, ~~Where dental pumping equipment connects to the water distribution system,~~ the water supply system shall be protected against backflow in accordance with Section 608.4314.1, 608.4314.2, 608.4314.5, 608.4314.6 or 608.4314.8.

608.17.10 Humidifiers. The water supply connection to

humidifiers that do not have internal backflow protection shall be protected against backflow by a backflow preventer conforming to ASSE 1012 or by an air gap.

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.~~

608.17-18 Protection of individual water supplies. An individual water supply shall be located and constructed so as to be safeguarded against contamination in accordance with the Arkansas Water Well Construction Commission, the

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 this code the *Arkansas Mechanical Code* and the Rules and Regulations to health care facilities licensed under Act-414, 1961, as amended, and administered by the *Arkansas Department of Health, Division of Health Care Facilities*[A19].

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.

The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.

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.

Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

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. Point-of-use reverse osmosis Drinking 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 recom-

mended 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 this code, the *Arkansas Gas Code* and the *Arkansas 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.

SECTION 614 TESTING AND REPAIR

614.1 Backflow Assembly Testing and Repair Programs. It is required that all backflow training programs that certify backflow tester technicians and repair technicians are accredited by the State Administrative Authority and have their teaching instructors re-certify every 5 years for testing and repair. It is the responsibility of the ~~testing-training~~ program to provide ~~documentation of documented~~ proof of re-certification for their program instructors as well as changes in instructors or curriculum, to the Arkansas Department of Health ~~and Human Services~~ p Plumbing and n Natural g Gas program. Additional requirements may be applicable as noted in the Plumbing Program's Policies and Procedures for Backflow Prevention Devices.

A Testing Technician or Repair Technician is any person meeting all applicable licensing and/or certification requirements of the State Administrative Authority. Repair Technicians shall maintain a current Tester Technician Certification in order to maintain their Repair Certification.

Testing of backflow and backpressure devices shall be done by a Testing Technician who will be responsible for the competence and accuracy of all test reports.

A Testing Technician shall perform all tests of the mechanical devices/assemblies and be responsible for the competence and accuracy of all test and reports.

The Testing Technician shall be equipped with and be competent to use all necessary tools, and other equipment necessary to test properly backflow prevention assemblies to determine that the assemblies are functioning properly.

Testing and/or Repair Technician certification shall be current in accordance with the educational and/or training requirements of the State Administrative Authority. The testing equipment being used is acceptable to the State Administrative Authority, and is in proper operating

condition and calibration. The Certified Testing Technician shall be equipped with, and be competent to use, all necessary tools, gauges, and other equipment necessary to test properly backflow prevention assemblies to determine if the assemblies are functioning properly.

A Repair Technician shall be responsible for all repairs performed on an assembly. ~~An Arkansas Plumbers license shall be required in addition to the Assembly Repair Training when repairing backflow prevention assemblies within the scope of the plumbing system.~~

Exception: ~~An additional Arkansas Plumbers License is not required if the Repair Technician holds a repair certificate of competency from the Department of Health Plumbing and Natural Gas Program for Repair Technician.~~

~~Other professionally licensed technicians may be authorized to repair backflow assemblies within their special jurisdiction if properly certified and it is determined to be necessary to meet the intent of this code by the administrative authority. Example: A professional fire sprinkler installer who meets all requirements except a plumbing license may be certified to repair assemblies on fire sprinkler systems only.~~

Cross-connection control survey standards shall be administered in accordance with the minimum requirements set forth by the Cross Connection Survey Program.

SECTION 615
LEAD FREE REQUIREMENTS
MOVED TO SECTION 605.2

CHAPTER 7 SANITARY DRAINAGE

User note:

About this chapter: Chapter 7 regulates the methods and piping systems that remove water that has served a purpose such as flushing water closets, bathing, culinary activities and equipment discharges. The types of materials, drainage fitting and the connection methods are covered for these systems that begin at the receiving fixtures and end at the point of disposal for the liquid waste. A design method for a gravity flow system of vertical and horizontal piping is provided based on the probability of flows from specific fixtures. Vacuum and pumped types of liquid waste removal methods are also regulated by this chapter.

SECTION 701 GENERAL

701.1 Scope. The provisions of this chapter shall govern the materials, design, construction and installation of sanitary drainage systems.

701.2 Connection to sewer required. Sanitary drainage piping from plumbing fixtures in buildings and sanitary drainage piping systems from premises shall be connected to a public sewer. Where a public sewer is not available, the sanitary drainage piping and systems shall be connected to a private sewage disposal system in compliance with state or local requirements. Where state or local requirements do not exist for private sewage disposal systems, the sanitary drainage piping and systems shall be connected to an approved private sewage disposal system that is in accordance with the *Arkansas Private Sewage Disposal Code*.

Exception: Sanitary drainage piping and systems that convey only the discharge from bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to connect to a public sewer or to a private sewage disposal system provided that the piping or systems are connected to a system in accordance with Chapter 13.

Sewer required. Every building in which plumbing fixtures are installed and all premises having drainage piping shall be connected to a public sewer, where available, or an approved private sewage disposal system in accordance with the applicable state laws and regulations.

701.3 Separate sewer connection. Every ~~A~~ building having plumbing fixtures installed and intended for human habitation, occupancy or use, on premises abutting on a street, alley or easement in which there is a public sewer, shall have a separate connection with the sewer ~~from other privately owned properties~~. Where located on the same ~~lot property~~, multiple buildings shall not be prohibited from connecting to a common building sewer that connects to the public sewer.

701.4 Sewage treatment. Sewage or other waste from a plumbing system that is deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to an approved form of treatment.

701.5 Damage to drainage system or public sewer. Wastes detrimental to the public sewer system or to the functioning of the sewage-treatment plant shall be treated and disposed of in accordance with Section 1003 as directed by the code official.

701.6 Tests. The sanitary drainage system shall be tested in accordance with Section 312.

~~**701.7 Connections.** Direct connection of a steam exhaust, blowoff or drip pipe shall not be made with the building drainage system. Wastewater when discharged into the building drainage system shall be at a temperature not higher than 140°F (60°C). When higher temperatures exist, approved cooling methods shall be provided.~~

~~**701.8 Drainage piping in food service areas.**~~

~~No soil, waste or drain pipe containing joints shall be located in ceilings over food processing or food storage areas in any food establishment, including markets and other food outlets, unless approved in writing by both Plumbing Administrative Authority and the Environmental Health Administrative Authority.~~

SECTION 702 MATERIALS

702.1 Above-ground sanitary drainage and vent pipe. Above-ground soil, waste and vent pipe shall conform to one of the standards listed in Table 702.1.

702.2 Underground building sanitary drainage and vent pipe. Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

702.3 Building sewer pipe. Building sewer pipe shall conform to one of the standards listed in Table 702.3.

702.4 Fittings. Pipe fittings shall be approved for installation with the piping material installed and shall ~~comply with~~ conform to the applicable respective pipe standards or one of the standards listed in Table 702.4.

702.5 Temperature rating. Where the waste water temperature will be greater than 140°F (60°C), the sanitary drainage piping material shall be rated for the highest temperature of the waste water.

702.65 Chemical waste system. A chemical waste system shall be completely separated from the sanitary drainage system. The chemical waste shall be treated in accordance with Section 803.2 before discharging to the sanitary drainage system. Separate drainage systems for chemical wastes and vent pipes shall be of an approved material that is resistant to corrosion and degradation for the concentrations of chemicals involved.

702.76 Lead bends and traps. Lead bends and traps shall not be less than $0.125\text{--}\frac{1}{8}$ inch (3.2mm) wall thickness.

SECTION 703 BUILDING SEWER

703.1 Building sewer pipe near the water service. ~~The proximity of a sewer to a water service shall comply with Section 603.2. Where the building sewer is installed within 10 feet (3048 mm) of the water service, as provided for in Section 603.2, the building sewer pipe shall conform to one of the standards for ABS plastic pipe, cast-iron pipe, copper or copper-alloy tubing, or PVC plastic pipe listed in Table 702.3.~~

703.2 Drainage pipe in filled ground. Where a building sewer or building drain is installed on filled or unstable ground, the drainage pipe shall conform to one of the standards for ABS plastic pipe, cast-iron pipe, copper or copper-alloy tubing, ~~or~~ PVC plastic pipe or polypropylene plastic pipe indicated listed in Table 702.3.

703.3 Sanitary and storm sewers. Where separate systems of sanitary drainage and storm drainage are installed in the same property, the sanitary and storm building sewers or drains shall be permitted to be laid side by side in one trench.

703.4 Existing building sewers and drains. ~~Where the entire sanitary drainage system of an existing building is replaced, existing building drains under concrete slabs and existing building sewers that will serve the new system shall be internally examined to verify that the piping is sloping in the correct direction, is not broken, is not obstructed and is sized for the drainage load of the new plumbing drainage system to be installed. Existing building sewers and drains shall connect with new building sewer and drainage systems only where found by examination and test to conform to the new system in quality of material. The code official shall notify the owner to make the changes necessary to conform to this code.~~

703.5 Cleanouts on building sewers. Cleanouts on building sewers shall be located as set forth in Section 708.

703.6 Combined sanitary and storm public sewer. Where the public sewer is a combined system for both sanitary and storm water, the sanitary sewer shall be connected independently to the public sewer.

TABLE 702.1
ABOVE-GROUND DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe <u>in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall</u>	ASTM D 2661; ASTM F 628; CSA B181.1; <u>ASTM F1488</u>
<u>Brass pipe</u>	<u>ASTM B 43</u>
Cast-iron pipe	ASTM A 74; CISPI 301; ASTM A 888
<u>Coextruded composite ABS DWV schedule 40 IPS pipe (solid)</u>	<u>ASTM F 1488</u>
<u>Coextruded composite ABS DWV schedule 40 IPS pipe (cellular core)</u>	<u>ASTM F 1488</u>
<u>Coextruded composite PVC DWV schedule 40 IPS pipe (solid)</u>	<u>ASTM F 1488</u>
<u>Coextruded composite PVC DWV schedule 40 IPS pipe (cellular core)</u>	<u>ASTM F 1488, ASTM F 891</u>
<u>Coextruded composite PVC IPS DR, PS140, PS200</u>	<u>ASTM F 1488</u>
Copper or copper-alloy pipe	ASTM B 42; <u>ASTM B43</u> ; ASTM B 302
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 306
Galvanized steel pipe	ASTM A 53
Glass pipe	ASTM C 1053
Polyolefin pipe	<u>ASTM F 1412</u> ; CAN/CSA- B181.3
Polyvinyl chloride (PVC) plastic pipe <u>(Type DWV) in IPS diameters, including Schedule 40, DR 22 (PS 200), and DR 24 (PS 140); with a solid, cellular core or composite wall</u>	ASTM D 2665; ASTM F 891 <u>ASTM F 2949</u> ; CSA B181.2; ASTM F 1488
<u>Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall</u>	<u>ASTM D 2949, ASTM F 1488</u>
<u>Polyvinylidene fluoride (PVDF) plastic pipe</u>	<u>ASTM F 1673; CSA B181.3</u>
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

TABLE 702.2
UNDERGROUND BUILDING DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D 2661; ASTM F 628; CSA B181.1; <u>ASTM F 1488</u>
Asbestos-cement pipe	<u>ASTM C 428</u>
Cast-iron pipe	ASTM A 74; CISPI 301; ASTM A 888
Coextruded composite ABS DWV schedule 40 IPS pipe (solid)	ASTM F 1488
Coextruded composite ABS DWV schedule 40 IPS pipe (cellular core)	ASTM F 1488
Coextruded composite PVC DWV schedule 40 IPS pipe (solid)	ASTM F 1488
Coextruded composite PVC DWV schedule 40 IPS pipe (cellular core)	ASTM F 1488; ASTM F 891
Coextruded composite PVC IPS DR, PS140, PS200 DWV	ASTM F 1488
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 306
<u>Polyethylene (PE) plastic pipe (SDR-PR)</u>	<u>ASTM F714</u>
Polyolefin pipe	ASTM F 1412; <u>ASTM F714</u> ; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe (Type DWV) in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D 2665; ASTM F 891 <u>F 1488</u> ; CSA-B181.2, <u>ASTM F 1488</u>
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	<u>ASTM D 2949, ASTM F 1488</u>
<u>Polyvinylidene fluoride (PVDF) plastic pipe</u>	<u>ASTM F 1673; CSA B181.3</u>
Stainless steel drainage systems, Type 316L	ASME A112.3.1

For SI: 1 inch = 25.4 mm.

SECTION 704 DRAINAGE PIPING INSTALLATION

704.1 Slope of horizontal drainage piping. Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The ~~minimum~~ slope of a horizontal drainage

pipe shall be ~~in accordance with not less than that indicated in~~ Table 704.1 except that where the drainage piping is upstream of a grease interceptor, the slope of the piping shall be not less than 1/4 inch per foot (2-percent slope).

**TABLE 704.1
SLOPE OF HORIZONTAL DRAINAGE PIPE**

SIZE (inches)	MINIMUM SLOPE (inch per foot)
2 1/2 or less	1/4 <u>a</u>
3 to 6	1/8 <u>a</u>
8 or larger	1/16 <u>a</u>

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.3 mm/m.

a. Slopes for piping draining to a grease interceptor shall comply with Section 704.1.

704.2 Reduction in pipe size in the direction of flow. ~~Change in size.~~ The size of the drainage piping shall not be reduced ~~in size~~ in the direction of the flow. The following shall not be considered as a reduction in size in the direction of flow:

1. A 4-inch by 3-inch (102mm by 76mm) water closet connection shall not be considered as a reduction in size if the:

2. A water closet bend fitting having a 4-inch (102 mm) inlet and a 3-inch (76 mm) outlet provided that the 4-inch leg of the fitting is upright and below, but not necessarily directly connected to, the water closet flange.

3. An offset closet flange.

704.3 Connections to offsets and bases of stacks. Horizontal branches shall connect to the bases of stacks at a point located not less than 10 times the diameter of the drainage stack downstream from the stack. ~~Except as prohibited by Section 704.2, horizontal branches shall connect to horizontal stack offsets at a point located not less than 10 times the diameter of the drainage stack downstream from the upper stack.~~

704.4 Future fixtures. Drainage piping for future fixtures shall terminate with an approved cap or plug.

704.5 Dead ends. ~~In the installation or removal of any part of a drainage system, dead ends shall be prohibited. Cleanout extensions and approved future fixture drainage piping shall not be considered as dead ends.~~

SECTION 705 JOINTS

705.1 General. This section contains provisions applicable to joints specific to sanitary drainage piping.

705.2 ABS plastic. Joints between ABS plastic pipe or fittings shall comply with Sections 705.2.1 through 705.2.3.

705.2.1 Mechanical joints. Mechanical joints on drainage pipes shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or ~~CAN/CSA-B602~~.

**TABLE 702.3
BUILDING SEWER PIPE**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or	ASTM D 2661; ASTM D 2751 ; ASTM F 628; <u>ASTM F 1488; CSA B181.1</u>
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters, including SDR 42 (PS 20), PS 35, SDR 35 (PS 45), PS 50, PS 100, PS 140, SDR 23.5 (PS 150) and PS 200; with a solid, cellular core or composite wall	<u>ASTM F 1488; ASTM D 2751</u>
Asbestos-cement pipe	<u>ASTM C 428</u>
Cast-iron pipe	ASTM A 74; ASTM A 888; CISPI 301
Coextruded composite ABS DWV schedule 40 IPS pipe (solid)	ASTM F 1488
Coextruded composite ABS DWV schedule 40 IPS pipe (cellular core)	ASTM F 1488
Coextruded composite PVC DWV schedule 40 IPS pipe (solid)	ASTM F 1488
Coextruded composite PVC DWV schedule 40 IPS pipe (cellular core)	ASTM F 1488
Coextruded composite PVC IPS DR, PS140, PS200, DWV	ASTM F 1488
Coextruded composite ABS sewer and drain DR PS in PS35, PS50, PS100, PS140, PS200	ASTM F 1488
Coextruded composite PVC sewer and drain DR PS in PS35, PS50, PS100, PS140, PS200	ASTM F 1488
Coextruded PVC sewer and drain PS 25, PS 50, PS 100 (cellular core)	ASTM F 891
Concrete pipe	ASTM C14; ASTM C76; CAN/CSA A257.1M; CAN/CSA A257.2M
Copper or copper-alloy tubing (Type K or L)	ASTM B 75; ASTM B 88; ASTM B 251
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F 714
Polypropylene (PP) plastic pipe	<u>ASTM F2736; ASTM F2764; CSA B182.13</u>

Polyvinyl chloride (PVC) plastic pipe (Type DWV, SDR26, SDR35, SDR41, PS50 or PS100) in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D 2665; ASTM F 891, ASTM F 1488, D-2949 ; ASTM D 3034; CSA B182.2; CAN/CSA B182.4
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters, including PS 25, SDR 41 (PS 28), PS 35, SDR 35 (PS 46), PS 50, PS 100, SDR 26 (PS 115), PS 140 and PS 200; with a solid, cellular core or composite wall	<u>ASTM F891; ASTM F1488; ASTM D3034; CSA B182.2; CSA B182.4</u>
Polyvinyl chloride (PVC) plastic pipe with a 12.5 inch O.D. and a solid, cellular core or composite wall	<u>ASTM D2949, ASTM F1488</u>
Polyvinylidene fluoride (PVDF) plastic pipe	<u>ASTM F1673; CSA B181.3</u>
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Vitrified clay pipe <u>For SI: 1 inch = 25.4 mm.</u>	ASTM C 4; ASTM C 700

Mechanical joints shall be installed only in underground systems unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

705.2.2 Solvent cementing. Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D 2235 or CSA B181.1 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, ASTM D 2661, ASTM F 628 or CSA B181.1. Solvent-cement joints shall be permitted above or below ground.

705.2.3 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.

~~**705.3 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.~~

~~**705.4 Brass.** Joints between brass pipe or fittings shall comply with Sections 705.34.1 through 705.43.4.~~

~~**705.4.1 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.~~

SANITARY DRAINAGE

**TABLE 702.4
PIPE FITTINGS**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe <u>in IPS diameters</u>	ASTM D 3311; CSA B181.1 ; ASTM D 2661; <u>ASTM 628; CSA B181.1</u>
<u>Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters</u>	<u>ASTM D 2751</u>
Cast iron	ASME B 16.4; ASME B 16.12; ASTM A 74; ASTM A 888; CISPI 301
Coextruded composite ABS DWV schedule 40 IPS pipe (solid or cellular core)	ASTM D 2661; ASTM D 3311; ASTM F 628
Coextruded composite PVC DWV schedule 40 IPS DR, PS140, PS200 (solid or cellular core)	ASTM D 2665; ASTM D 3311; ASTM F 891
Coextruded composite ABS sewer and drain DR PS in PS35, PS50, PS100, PS140, PS200	ASTM D 2751
Coextruded composite PVC sewer and drain DR PS in PS35, PS50, PS100, PS140, PS200	ASTM D 3034
Copper or copper alloy	ASME B 16.15; ASME B 16.18; ASME B 16.22; ASME B 16.23; ASME B16.26; ASME B 16.29
Glass	ASTM C 1053
Gray iron and ductile iron	AWWA C 110/ A21.10
Malleable iron	ASME B 16.3
<u>Polyethylene</u>	<u>ASTM D2683</u>
<u>Polyolefin</u>	<u>ASTM F 1412; CSA B181.3</u>
Polyvinyl chloride (PVC) plastic <u>in IPS diameters</u>	ASTM D 3311 ; ASTM D 2665; ASTM F 1866
<u>Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters</u>	<u>ASTM D 3034</u>
<u>Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D.</u>	<u>ASTM D 2949</u>
<u>Polyvinylidene fluoride (PVDF) plastic pipe</u>	<u>ASTM F 1673; CSA B181.3</u>
Stainless steel drainage systems, Types 304 and 316L	ASME A 112.3.1
Steel	ASME B 16.9; ASME B16.11; ASME B16.28
<u>Vitrified clay</u>	<u>ASTM C 700</u>

For SI: 1 inch = 25.4 mm.

~~**705.4.2 Mechanical joints.** Mechanical joints shall be installed in accordance with the manufacturer's instructions.~~

~~**705.4.3 Threaded joints.** Threads shall conform to ASME B1.20.1. Pipe joint compound or tape shall be applied on the male threads only.~~

~~**705.4.4 Welded joints.** All joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.~~

~~**705.35 Cast iron.** Joints between cast-iron pipe or fittings shall comply with Sections 705.3.1 through 705.3.3.~~

705.3 5.1 Caulked joints. Joints for hub and spigot pipe shall be firmly packed with oakum or hemp. Molten lead shall be poured in one operation to a depth of not less than 1 inch (25 mm). The lead shall not recede more than $\frac{1}{8}$ 0.125-inch (3.2 mm) below the rim of the hub and shall be caulked tight. Paint, varnish or other coatings shall not be permitted on the jointing material until after the joint has been tested and approved. Lead shall be run in one pouring and shall be caulked tight. Acid-resistant rope and acid proof cement shall be permitted.

705.3 5.2 Compression gasket joints. Compression gaskets for hub and spigot pipe and fittings shall conform to ASTM C 564 and shall be tested to ASTM C 1563. Gaskets shall be compressed when the pipe is fully inserted.

~~**705.35.3 Mechanical joint coupling.** Mechanical joint couplings for hubless pipe and fittings shall consist of an elastomeric sealing sleeve and a metallic shield that comply with CISPI 310, ASTM C 1277 or ASTM C 1540. The elastomeric sealing sleeve shall conform to ASTM C 564 or CSA B602 and shall be provided with a center stop. Mechanical joint couplings shall be installed in accordance with the manufacturer's installation instructions.~~

705.46 Concrete joints. Joints between concrete pipe and fittings shall be made with an elastomeric seal conforming to ASTM C 443, ASTM C 1173, ~~CAN/CSA A257.3M~~ or ~~CAN/CSA B602~~.

~~**705.7 Coextruded composite ABS pipe, joints.** Joints between coextruded composite pipe with an ABS outer layer or ABS fittings shall comply with Sections 705.7.1 and 705.7.2.~~

~~**705.7.1 Mechanical joints.** Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D 3212 or CAN/CSA B602. Mechanical joints shall not be installed in above ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.~~

~~**705.7.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D 2235 or CSA B181.1 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, ASTM D 2661, ASTM F 628 or CSA B181.1. Sol-~~

~~vent cement joints shall be permitted above or below ground.~~

~~**705.8 Coextruded composite PVC pipe.** Joints between coextruded composite pipe with a PVC outer layer or PVC fittings shall comply with Sections 705.8.1 and 705.8.2.~~

~~**705.8.1 Mechanical joints.** Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM D 3212. Mechanical joints shall not be installed in above-ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.~~

~~**705.8.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A colored primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA B137.3, CSA B181.2 or CSA B182.1 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.~~

705.59 Copper pipe. Joints between copper or copper-alloy pipe or fittings shall comply with Sections 705.59.1 through 705.59.5.

705.59.1 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.

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

705.59.3 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.

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

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

705.640 Copper tubing. Joints between copper or copper-alloy tubing or fittings shall comply with Sections 705.640.1 through 705.640.3.

705.640.1 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.

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

705.640.3 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. The joint shall be soldered with a solder conforming to ASTM B 32.

705.744 Borosilicate glass joints. Glass-to-glass connections shall be made with a bolted compression-type stainless steel (300 series) coupling with contoured acid-resistant elastomeric compression ring and a fluorocarbon polymer inner seal ring; or with caulked joints in accordance with Section 705.744.1.

705.744.1 Caulked joints. Every lead-caulked joint for hub and spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than 1 inch (25 mm) deep and not to extend more than $0.125\frac{1}{8}$ -inch (3.2 mm) below the rim of the hub. Paint, varnish or other coatings shall not be permitted on the jointing material until after the joint has been tested and approved. Lead shall be run in one pouring and shall be caulked tight. Acid-resistant rope and acidproof cement shall be permitted.

705.842 Steel. Joints between galvanized steel pipe or fittings shall comply with Sections 705.842.1 and 705.842.2.

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

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

705.943 Lead. Joints between lead pipe or fittings shall comply with Sections 705.943.1 and 705.943.2.

705.943.1 Burned. Burned joints shall be uniformly fused together into one continuous piece. The thickness of the joint shall be at least as thick as the lead being joined. The filler metal shall be of the same material as the pipe. A flux conforming to ASTM B 813 shall be applied.

705.943.2 Wiped. Joints shall be fully wiped, with an exposed surface on each side of the joint not less than $0.75\frac{3}{4}$ inch (19.1 mm). The joint shall be at least $0.325\frac{3}{8}$ inch (9.5 mm) thick at the thickest point.

705.1044 PVC plastic. Joints between PVC plastic pipe or fittings shall comply with Sections 705.1044.1 through 705.1044.3.

705.1044.1 Mechanical joints. Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or CSA B602. Mechanical joints shall not be installed in above-ground systems, unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

705.1044.2 Solvent cementing. Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA B137.3, CSA B181.2 or CSA B182.1 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. [A clear primer](#)

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may be used for the final connections inside a finished building or structure and/or during the rough-in phase of a job, if the finished floor will be stained concrete. [A20]

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

1. The solvent cement used is third-party certified as conforming to ASTM D2564.

2. The solvent cement is used only for joining PVC drain, waste and vent pipe and fittings in non-pressure applications in sizes up to and including 4 inches (102 mm) in diameter.

705.1014.3 Threaded joints. Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80, or heavier. Pipe threads pipe shall be permitted made to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.

705.1145 Vitrified clay. Joints between vitrified clay pipe or fittings shall be made with an elastomeric seal conforming to ASTM C 425, ASTM C 1173 or CSA B602.

705.1246 Polyethylene plastic pipe. Joints between polyethylene plastic pipe and fittings shall be underground and shall comply with Section 705.1246.1 or 705.1246.2.

705.1246.1 Heat-fusion joints. Joint surfaces shall be clean and free from moisture. All joint surfaces shall be cut, heated to melting temperature and joined using tools specifically designed for the operation. Joints shall be undisturbed until cool. Joints shall be made in accordance with ASTM D 2657 and the manufacturer's instructions.

705.1246.2 Mechanical joints. Mechanical joints in drainage piping shall be made with an elastomeric seal conforming to ASTM C 1173, ASTM D 3212 or CSA B602. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

705.1347 Polyolefin plastic. Joints between polyolefin plastic pipe and fittings shall comply with Sections 705.1347.1 and 705.1347.2.

705.1347.1 Heat-fusion joints. Heat-fusion joints for polyolefin pipe and tubing joints shall be installed with socket-type heat-fused polyolefin fittings or electrofusion polyolefin 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 1412 or CSA B181.3.

705.1347.2 Mechanical and compression sleeve joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.

705.14 Polyvinylidene fluoride plastic. Joints between polyvinylidene plastic pipe and fittings shall comply with Sections 705.14.1 and 705.14.2.

705.14.1 Heat-fusion joints. Heat-fusion joints for polyvinylidene fluoride pipe and tubing joints shall be installed with socket-type heat-fused polyvinylidene fluoride fit-

tings or electrofusion polyvinylidene fittings and couplings. 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 1673.

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

705.15 Polypropylene plastic. The joint between polypropylene plastic pipe and fittings shall incorporate an elastomeric seal. The joint shall conform to ASTM D 3212. Mechanical joints shall not be installed above ground.

705.1618 Joints between different materials. Joints between different piping materials shall be made with a mechanical joint of the compression or mechanical-sealing type conforming to ASTM C 1173 (underground only), ASTM C 1460 or ASTM C 1461. Connectors and adapters shall be approved for the application and such joints shall have an elastomeric seal conforming to ASTM C 425, ASTM C 443, ASTM C 564, ASTM C 1440, ~~ASTM D 1869~~, ASTM F 477, CSA A257.3M or CSA B602, or as required in Sections 705.1618.1 through 705.1618.7. Joints between glass pipe and other types of materials shall be made with adapters having a TFE seal. Joints shall be installed in accordance with the manufacturer's instructions.

705.1618.1 Copper or ~~copper-alloy~~ tubing to cast-iron hub pipe. Joints between copper or ~~copper-alloy~~ tubing and cast-iron hub pipe shall be made with a ~~brass-copper-alloy~~ ferrule or compression joint. The copper or ~~copper-alloy~~ tubing shall be soldered to the ferrule in an approved manner, and the ferrule shall be joined to the cast-iron hub by a caulked joint or a mechanical compression joint.

705.1618.2 Copper or copper-alloy pipe or tubing to galvanized steel pipe. Joints between copper or copper-alloy pipe or tubing and galvanized steel pipe shall be made with a ~~copper-alloy brass converter~~ fitting or dielectric fitting. The copper tubing shall be soldered to the fitting in an approved manner, and the fitting shall be screwed to the threaded pipe.

705.1618.3 Cast-iron pipe to galvanized steel or brass pipe. Joints between cast-iron and galvanized steel ~~or brass pipe~~ shall be made by either caulked or threaded joints or with an approved adapter fitting.

705.1618.4 Plastic pipe or tubing to other piping material. Joints between different types of plastic pipe ~~or between plastic pipe and other piping material~~ shall be made with an approved adapter fitting or by a solvent cement joint only where a single joint is made between ABS and PVC pipes at the end of a building drainage pipe and the beginning of a building sewer pipe using a solvent cement complying with ASTM D3138. Joints between plastic pipe and cast-iron hub pipe shall be made by a caulked joint or a mechanical compression joint.

705.1618.5 Lead pipe to other piping material. Joints between lead pipe and other piping material shall be made

by a wiped joint to a caulking ferrule, soldering nipple, or bushing or shall be made with an approved adapter fitting.

705.1648.6 Borosilicate glass to other materials. Joints between glass pipe and other types of materials shall be made with adapters having a TFE seal and shall be installed in accordance with the manufacturer's instructions.

705.1648.7 Stainless steel drainage systems to other materials. Joints between stainless steel drainage systems and other piping materials shall be made with approved mechanical couplings.

705.1749-Drainage slip joints. Slip joints shall comply with Section 405.8.

705.1820 Caulking ferrules. Ferrules shall be of red ~~brass~~ copper-alloy and shall be in accordance with Table 705.1820.

**TABLE 705.1820
CAULKING FERRULE SPECIFICATIONS**

PIPE SIZES (inches)	INSIDE DIAMETER (inches)	LENGTH (inches)	MINIMUM WEIGHT EACH
2	2 ¹ / ₄	4 ¹ / ₂	1 pound
3	3 ¹ / ₄	4 ¹ / ₂	1 pound 12 ounces
4	4 ¹ / ₄	4 ¹ / ₂	2 pounds 8 ounces

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 pound = 0.454 kg.

705.1924 Soldering bushings. Soldering bushings shall be of copper or copper-alloy ~~red-brass~~ and shall be in accordance with Table 705.1924.

**TABLE 705.1924
SOLDERING BUSHING SPECIFICATIONS**

PIPE SIZES (inches)	MINIMUM WEIGHT EACH
1 ¹ / ₄	6 ounces
1 ¹ / ₂	8 ounces
2	14 ounces
2 ¹ / ₂	1 pound 6 ounces
3	2 pounds
4	3 pounds 8 ounces

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 pound = 0.454 kg.

705.2022 Stainless steel drainage systems. O-ring joints for stainless steel drainage systems shall be made with an approved elastomeric seal.

SECTION 706 CONNECTIONS BETWEEN DRAINAGE PIPING AND FITTINGS

706.1 Connections and changes in direction. ~~All~~ eConnections and changes in direction of the sanitary drainage system shall be made with approved drainage fittings. Connections between drainage piping and fixtures shall conform to Section 405.

706.2 Obstructions. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow

in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type. This section shall not be applicable to tubular waste fittings used to convey vertical flow upstream of the trap seal liquid level of a fixture trap.

706.3 Installation of fittings. Fittings shall be installed to guide sewage and waste in the direction of flow. Change in direction shall be made by fittings installed in accordance with Table 706.3. Change in direction by combination fittings, side inlets or increasers shall be installed in accordance with Table 706.3 based on the pattern of flow created by the fitting. Double sanitary tee patterns shall not receive the discharge of back-to-back water closets and fixtures or appliances with pumping action discharge. (Double fixture fittings may be used.) Double quarter bends shall be installed in horizontal to vertical flow applications only.

Exception: Back-to-back water closet connections to double sanitary tees shall be permitted where the horizontal developed length between the outlet of the water closet and the connection to the double sanitary tee pattern is 18 inches (457 mm) or greater.

**TABLE 706.3
FITTINGS FOR CHANGE IN DIRECTION**

TYPE OF FITTING PATTERN	CHANGE IN DIRECTION		
	Horizontal to vertical	Vertical to horizontal	Horizontal to horizontal
Sixteenth bend	X	X	X
Eighth bend	X	X	X
Sixth bend	X	X	X
Quarter bend	X	X _a	X _a
Short sweep	X	X _{a,b}	X _a
Long sweep	X	X	X
Sanitary tee ^a	X ^c	-	-
Wye	X	X	X
Combination wye and eighth bend	X	X	X

For SI: 1 inch = 25.4 mm.

The fittings shall only be permitted for a 2-inch or smaller fixture drain. Three inches or larger.

For a limitation on double sanitary tees, see Section 706.3.

Sanitary tees may be used in a horizontal position for lavatories and sinks: above floor level only.

706.4 Heel- or side-inlet quarter bends. Heel-inlet quarter bends shall be an acceptable means of connection, except where the quarter bend serves a water closet. A low-heel inlet shall not be used as a wet-vented connection. Side-inlet quarter bends shall be an acceptable means of connection for drainage, wet venting and stack venting arrangements.

SECTION 707 PROHIBITED JOINTS AND CONNECTIONS

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

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Cement or concrete joints.

Mastic or hot-pour bituminous joints.

Joints made with fittings not approved for the specific installation.

Joints between different diameter pipes made with elastomeric rolling O-rings.

Solvent-cement joints between different types of plastic pipe, except where provided for in Section 705.16.4.

Saddle-type fittings.

SECTION 708 CLEANOUTS

708.1 Cleanouts required. Cleanouts shall be provided for drainage piping in accordance with Sections 708.1.1 through 708.1.11.

708.1.1 Horizontal drains and building drains. Horizontal drainage pipes in buildings shall have cleanouts located at intervals of not more than 100 feet (30 480 mm). Building drains shall have cleanouts located at intervals of not more than 100 feet (30 480 mm) except where manholes are used instead of cleanouts, the manholes shall be located at intervals of not more than 400 feet (122 m). The interval length shall be measured from the cleanout or manhole opening, along the *developed length* of the piping to the next drainage fitting providing access for cleaning, the end of the horizontal drain or the end of the *building drain*.

Exception: Horizontal *fixture drain* piping serving a non-removable trap shall not be required to have a cleanout for the section of piping between the trap and the vent connection for such trap.

708.1.2 Building sewers. Building sewers smaller than 8 inches (203 mm) shall have cleanouts located at intervals of not more than 100 feet (30 480 mm). Building sewers 8 inches (203 mm) and larger shall have a manhole located not more than 200 feet (60 960 mm) from the junction of the *building drain* and *building sewer* and at intervals of not more than 400 feet (122 m). The interval length shall be measured from the cleanout or manhole opening, along the *developed length* of the piping to the next drainage fitting providing access for cleaning, a manhole or the end of the *building sewer*.

708.1.3.35 Building drain and building sewer junction. There shall be a two-way cleanout at the junction of the building drains and the building sewer. The cleanout shall be brought up to finished ground level. A cleanout shall be installed within 2 feet (610 mm) downstream of any backwater valve. For the requirements of this section, the removal of the water closet shall not be a substitute for the required cleanout access.

708.1.4 Changes of direction. Where a horizontal drainage pipe, a *building drain* or a *building sewer* has a change of horizontal direction greater than 45 degrees (0.79 rad), a cleanout shall be installed at the change of direction. Where more than one change of horizontal direction greater than 45 degrees (0.79 rad) occurs within 40 feet (12 192 mm) of

developed length of piping, the cleanout installed for the first change of direction shall serve as the cleanout for all changes in direction within that 40 feet (12 192 mm) of *developed length* of piping.

708.1.5 Cleanout size. Cleanouts shall be the same size as the piping served by the cleanout, except that cleanouts for piping larger than 4 inches (102 mm) need not be larger than 4 inches (102 mm).

Exceptions:

A removable P-trap with slip or ground joint connections can serve as a cleanout for drain piping that is one size larger than the P-trap size.

Cleanouts located on *stacks* can be one size smaller than the *stack* size.

The size of cleanouts for cast-iron piping can be in accordance with the referenced standards for cast-iron fittings as indicated in Table 702.4.

708.1.6 Cleanout plugs. Cleanout plugs shall be of copper-alloy, plastic or other *approved* materials. Cleanout plugs for borosilicate glass piping systems shall be of borosilicate glass. Copper-alloy cleanout plugs shall conform to ASTM A74 and shall be limited for use only on metallic piping systems. Plastic cleanout plugs shall conform to the referenced standards for plastic pipe fittings, as indicated in Table 702.4. Cleanout plugs shall have a raised square head, a countersunk square head or a countersunk slot head. Where a cleanout plug will have a trim cover screw installed into the plug, the plug shall be manufactured with a blind end threaded hole for such purpose.

708.1.7 Manholes. Manholes and manhole covers shall be of an *approved* type. Manholes located inside of a building shall have gas-tight covers that require tools for removal.

708.1.8 Installation arrangement. The installation arrangement of a cleanout shall enable cleaning of drainage piping only in the direction of drainage flow.

Exceptions:

Test tees serving as cleanouts.

A two-way cleanout installation that is *approved* for meeting the requirements of Section 708.1.3.

708.1.9 Required clearance. Cleanouts for 6-inch (153 mm) and smaller piping shall be provided with a clearance of not less than 18 inches (457 mm) from, and perpendicular to, the face of the opening to any obstruction. Cleanouts for 8-inch (203 mm) and larger piping shall be provided with a clearance of not less than 36 inches (914 mm) from, and perpendicular to, the face of the opening to any obstruction.

708.1.10 Cleanout access. Required cleanouts shall not be installed in concealed locations. For the purposes of this section, concealed locations include, but are not limited to, the inside of plenums, within walls, within floor/ceiling assemblies, below grade and in crawl spaces where the height from the crawl space floor to the nearest obstruction along the path from the crawl space opening to the cleanout location is less than 24 inches (610 mm). Cleanouts

with openings at a finished wall shall have the face of the opening located within 1½ inches (38 mm) of the finished wall surface. Cleanouts located below grade shall be extended to grade level so that the top of the cleanout plug is at or above grade. A cleanout installed in a floor or walkway that will not have a trim cover installed shall have a countersunk plug installed so the top surface of the plug is flush with the finished surface of the floor or walkway.

708.1.10.1 Cleanout plug trim covers. Trim covers and access doors for cleanout plugs shall be designed for such purposes and shall be *approved*. Trim cover fasteners that thread into cleanout plugs shall be corrosion resistant. Cleanout plugs shall not be covered with mortar, plaster or any other permanent material.

708.1.10.2 Floor cleanout assemblies. Where it is necessary to protect a cleanout plug from the loads of vehicular traffic, cleanout assemblies in accordance with ASME A112.36.2M shall be installed.

708.1.11 Prohibited use. The use of a threaded cleanout opening to add a fixture or to extend piping shall be prohibited except where another cleanout of equal size is installed with the required access and clearance.

708.1 Scope. This section shall govern the size, location, installation and maintenance of drainage pipe cleanouts.

708.2 Cleanout plugs. Cleanout plugs shall be brass or plastic, or other approved materials. Brass cleanout plugs shall be utilized with metallic drain, waste and vent piping only and shall conform to ASTM A 74, ASME A112.3.1 or ASME A112.36.2M. Cleanouts with plate style access covers shall be fitted with corrosion resistant fasteners. Plastic cleanout plugs shall conform to the requirements of Section 702.4. Plugs shall have raised square or countersunk square heads. Countersunk heads shall be installed where raised heads are a trip hazard. Cleanout plugs with borosilicate glass systems shall be of borosilicate glass.

708.3 Where required. Cleanouts shall be located in accordance with Sections 708.3.1 through 708.3.6.

708.3.1 Horizontal drains within buildings. All horizontal drains shall be provided with cleanouts located not more than 100 feet (30 480 mm) apart.

708.3.2 Building sewers. Building sewers shall be provided with cleanouts located not more than 100 feet (30 480 mm) apart measured from the upstream entrance of the cleanout. For building sewers 8 inches (203 mm) and larger, manholes shall be provided and located not more than 200 feet (60 960 mm) from the junction of the building drain and building sewer, at each change in direction and at intervals of not more than 400 feet (122 m) apart. Manholes and manhole covers shall be of an approved type.

708.3.3 Changes of direction. Cleanouts shall be installed at each change of direction greater than 45 degrees (0.79 rad) in the building sewer, building drain and horizontal

waste or soil lines. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet (12 192 mm) of developed length of the drainage piping.

708.3.4 Base of stack. A cleanout shall be provided at the base of each waste or soil stack.

708.3.5 Building drain and building sewer. There shall be a two way cleanout at the junction of the building drains and the building sewer. The cleanout shall be brought up to finished ground level. A cleanout shall be installed within 2 feet (610 mm) downstream of any backwater valve.

708.3.6 Manholes. Manholes serving a building drain shall have secured gas tight covers and shall be located in accordance with Section 708.3.2.

708.4 Concealed piping. Cleanouts on concealed piping or piping under a floor slab or in a crawl space of less than 24 inches (610 mm) in height or a plenum shall be extended through and terminate flush with the finished wall, floor or ground surface or shall be extended to the outside of the building. Cleanout plugs shall not be covered with cement, plaster or any other permanent finish material. Where it is necessary to conceal a cleanout or to terminate a cleanout in an area subject to vehicular traffic, the covering plate, access door or cleanout shall be of an approved type designed and installed for this purpose.

708.5 Opening direction. Every cleanout shall be installed to open to allow cleaning in the direction of the flow of the drainage pipe or at right angles thereto.

708.6 Prohibited installation. Cleanout openings shall not be utilized for the installation of new fixtures, except where approved and where another cleanout of equal access and capacity is provided.

708.7 Minimum size. Cleanouts shall be the same nominal size as the pipe they serve up to 4 inches (102 mm). For pipes larger than 4 inches (102 mm) nominal size, the minimum size of the cleanout shall be 4 inches (102 mm).

Exceptions:

“P” trap connections with slip joints or ground joint connections, or stack cleanouts that are not more than one pipe diameter smaller than the drain served, shall be permitted.

Cast iron cleanout sizing shall be in accordance with referenced standards in Table 702.4, ASTM A 74 for hub and spigot fittings or ASTM A 888 or CISPI 301 for hubless fittings.

708.8 Clearances. Cleanouts on 6 inch (153 mm) and smaller pipes shall be provided with a clearance of not less than 18 inches (457 mm) for rodding. Cleanouts on 8 inch (203 mm) and larger pipes shall be provided with a clearance of not less than 36 inches (914 mm) for rodding.

708.9 Access. Access shall be provided to all cleanouts.

**TABLE 709.1
DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS**

FIXTURE TYPE	DRAINAGE FIXTURE UNIT VALUE AS LOAD FACTORS	MINIMUM SIZE OF TRAP (inches)
Automatic clothes washers, commercial ^{a,g}	3	2
Automatic clothes washers, residential ^g	2	2
Bathroom group as defined in Section 202 (1.6 gpf water closet) ^f	5	—
Bathroom group as defined in Section 202 (water closet flushing greater than 1.6 gpf) ^f	6	—
Bathtub ^b (with or without overhead shower or whirlpool attachments)	2	1½
Bidet	1	1¼
Combination sink and tray	2	1½
Dental lavatory	1	1¼
Dental unit or cuspidor	1	1¼
Dishwashing machine, ^c domestic	2	1½
Drinking fountain	½	1¼
Emergency floor drain	0	2
Floor drains ^h	2 ^h	2
Floor sinks	Note h	2
Kitchen sink, domestic	2	1½
Kitchen sink, domestic with food waste grinder and/or dishwasher	2	1½
Laundry tray (1 or 2 compartments)	2	1½
Lavatory	1	1¼
Shower (<u>based on the total flow rate through showerheads and body sprays</u>)		
<u>Flow rate:</u>		
<u>5.7 gpm or less</u>	2	1½
<u>Greater than 5.7 gpm to 12.3 gpm</u>	3	2
<u>Greater than 12.3 gpm to 25.8 gpm</u>	5	3
<u>Greater than 25.8 gpm to 55.6 gpm</u>	6	4
Service sink	2	1½
Sink	2	1½
Urinal	4	Note d
Urinal, 1 gallon per flush or less	2 ^e	Note d
Urinal, nonwater supplied	½	Note d
Wash sink (circular or multiple) each set of faucets	2	1½
Water closet, flushometer tank, public or private	4 ^e	Note d
Water closet, private (1.6 gpf)	3 ^e	Note d
Water closet, private (flushing greater than 1.6 gpf)	4 ^e	Note d
Water closet, public (1.6 gpf)	4 ^e	Note d
Water closet, public (flushing greater than 1.6 gpf)	6 ^e	Note d

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L, gpf = gallon per flushing cycle, gpm = gallon per minute.

For traps larger than 3 inches, use Table 709.2.

A showerhead over a bathtub or whirlpool bathtub attachment does not increase the drainage fixture unit value.

See Sections 709.2 through 709.4 for methods of computing unit value of fixtures not listed in this table or for rating of devices with intermittent flows.

Trap size shall be consistent with the fixture outlet size.

For the purpose of computing loads on building drains and sewers, water closets and urinals shall not be rated at a lower drainage fixture unit unless the lower values are confirmed by testing.

For fixtures added to a dwelling unit bathroom group, add the dfu value of those additional fixtures to the bathroom group fixture count.

See Section 406.2.3 for sizing requirements for fixture drain, branch drain, and drainage stack for an automatic clothes washer standpipe.

See Sections 709.4 and 709.4.1.

SECTION 709 FIXTURE UNITS

709.1 Values for fixtures. Drainage fixture unit values as given in Table 709.1 designate the relative load weight of different kinds of fixtures that shall be employed in estimating the total load carried by a soil or waste pipe, and shall be used in connection with Tables 710.1(1) and 710.1(2) of sizes for soil, waste and vent pipes for which the permissible load is given in terms of fixture units.

709.2 Fixtures not listed in Table 709.1. Fixtures not listed in Table 709.1 shall have a drainage fixture unit load based on the outlet size of the fixture in accordance with Table 709.2. The minimum trap size for unlisted fixtures shall be the size of the drainage outlet but not less than ~~1.25~~ **1 1/4** inches (32 mm).

709.3 Conversion of gpm flow to dfu values. ~~Values for continuous and semicontinuous flow. Drainage fixture unit values for continuous and semicontinuous flow into a drainage system where discharges to a waste receptor or to a drainage system are only known in gallons per minute (liters per second) values, the drainage fixture unit values for those flows shall be computed on the basis that 1 gpm (0.06 L/s) of flow is equivalent to two fixture units.~~

709.4 Values for indirect waste receptor. The drainage fixture unit load of an indirect waste receptor receiving the discharge of indirectly connected fixtures shall be the sum of the drainage fixture unit values of the fixtures that discharge to the receptor, but not less than the drainage fixture unit value given for the indirect waste receptor in Table 709.1 or 709.2.

709.4.1 Clear-water waste receptors. ~~Where waste receptors such as floor drains, floor sinks and hub drains receive only clear-water waste from display cases, refrigerated display cases, ice bins, coolers and freezers, such receptors shall have a drainage fixture unit value of one-half.~~

**TABLE 709.2
DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR TRAPS**

FIXTURE DRAIN OR TRAP SIZE (inches)	DRAINAGE FIXTURE UNIT VALUE
1 1/4	1
1 1/2	2
2	3
2 1/2	4
3	5
4	6

For SI: 1 inch = 25.4 mm.

SECTION 710 DRAINAGE SYSTEM SIZING

710.1 Maximum fixture unit load. The maximum number of drainage fixture units connected to a given size of building sewer, building drain or horizontal branch of the building drain shall be determined using Table 710.1(1). The maximum number of drainage fixture units connected to a given size of horizontal branch or vertical soil or waste stack shall be determined using Table 710.1(2). A building sewer serving a building that contains a water closet shall be a minimum of 4 inches (102 mm). No portion of the drainage system

installed underground or below a basement, cellar or slab, shall be less than two ~~(2)~~ inches (**51 mm**) in diameter. [A21]

**TABLE 710.1(1)
BUILDING DRAINS AND SEWERS**

DIAMETER OF PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS CONNECTED TO ANY PORTION OF THE BUILDING DRAIN OR THE BUILDING SEWER, INCLUDING BRANCHES OF THE BUILDING DRAIN ^a			
	Slope per foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
1 1/4	—	—	1	1
1 1/2	—	—	3	3
2	—	—	21	26
2 1/2	—	—	24	31
3	—	36	42	50
4	—	180	216	250
5	—	390	480	575
6	—	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.3 mm/m.

a. The minimum size of any building drain serving a water closet shall be 3 inches.

**TABLE 710.1(2)
HORIZONTAL FIXTURE BRANCHES AND STACKS ^a**

DIAMETER OF PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)			
	Total for horizontal branch	Stacks ^b		
		Total discharge into one branch interval	Total for stack of three branch intervals or less	Total for stack greater than three branch intervals
1 1/2	3	2	4	8
2	6	6	10	24
2 1/2	12	9	20	42
3	20	20	48	72
4	160	90	240	500
5	360	200	540	1,100
6	620	350	960	1,900
8	1,400	600	2,200	3,600
10	2,500	1,000	3,800	5,600
12	3,900	1,500	6,000	8,400
15	7,000	Note c	Note c	Note c

For SI: 1 inch = 25.4 mm.

Does not include branches of the building drain. Refer to Table 710.1(1). Stacks shall be sized based on the total accumulated connected load at each story or branch interval. As the total accumulated connected load decreases, stacks are permitted to be reduced in size. Stack diameters shall not be reduced to less than one-half of the diameter of the largest stack size required.

c. Sizing load based on design criteria.

710.1.1 Horizontal stack offsets. Horizontal stack offsets shall be sized as required for building drains in accordance with Table 710.1(1), except as required by Section 711.34.

710.1.2 Vertical stack offsets. Vertical stack offsets shall be sized as required for straight stacks in accordance with

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Table 710.1(2), except where required to be sized as a building drain in accordance with Section 711.1.1.

710.2 Future fixtures. Where provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain pipes.

SECTION 711 OFFSETS IN DRAINAGE PIPING IN BUILDINGS OF FIVE STORIES OR MORE

711.1 Horizontal branch connections above or below vertical stack offsets. If a horizontal branch connects to the stack within 2 feet (610 mm) above or below a vertical stack offset, and the offset is located more than four branch intervals below the top of the stack, the offset shall be vented in accordance with Section 907.15.

711.1.1 Omission of vents for vertical stack offsets. Vents for vertical offsets required by Section 711.1 shall not be required where the stack and its offset are sized as a building drain [see Table 710.1(1)].

~~**711.2 Horizontal branch connections to horizontal stack offsets.** Where a horizontal stack offset is located more than four branch intervals below the top of the stack, a horizontal branch shall not connect within the horizontal stack offset or within 2 feet (610 mm) above or below such offset.~~

711.23 Horizontal stack offsets. A stack with a horizontal offset located more than four branch intervals below the top of the stack shall be vented in accordance with Section 907.15 and sized as follows:

The portion of the stack above the offset shall be sized as for a vertical stack based on the total number of drainage fixture units above the offset.

The offset shall be sized in accordance with Section 710.1.1.

The portion of the stack below the offset shall be sized as for the offset or based on the total number of drainage fixture units on the entire stack, whichever is larger [see Table 710.1(2), Column 5].

~~**711.23.1 Omission of vents for horizontal stack offsets.** Vents for horizontal stack offsets required by Section 711.23 shall not be required where the stack and its offset are one pipe size larger than required for a building drain [see Table 710.1(1)] and the entire stack and offset are not less in cross-sectional area than that required for a straight stack plus the area of an offset vent as provided for in Section 907.15. Omission of offset vents in accordance with this section shall not constitute approval of horizontal branch connections within the offset or within 2 feet (610 mm) above or below the offset.~~

711.3 4-Offsets below lowest branch. Where a vertical offset occurs in a soil or waste stack below the lowest horizontal branch, a change in diameter of the stack because of the offset shall not be required. If a horizontal offset occurs in a soil or waste stack below the lowest horizontal branch, the required diameter of the offset and the stack below it shall be determined as for a building drain in accordance with Table 710.1(1).

SECTION 712 SUMPS AND EJECTORS

712.1 Building subdrains. Building subdrains that cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or other approved method. In other than existing structures, the sump shall not receive drainage from any piping within the building capable of being discharged by gravity to the building sewer.

712.2 Valves required. A check valve and a full open valve located on the discharge side of the check valve shall be installed in the pump or ejector discharge piping between the pump or ejector and the gravity drainage system. Access shall be provided to such valves. Such valves shall be located above the sump cover required by Section 712.1 or, where the discharge pipe from the ejector is below grade, the valves shall be accessibly located outside the sump below grade in an access pit with a removable access cover.

712.3 Sump design. The sump pump, pit and discharge piping shall conform to the requirements of Sections 712.3.1 through 712.3.5.

712.3.1 Sump pump. The sump pump capacity and head shall be appropriate to anticipated use requirements.

712.3.2 Sump pit. The sump pit shall be not less than 18 inches (457 mm) in diameter and not less than 24 inches (610 mm) in depth deep, unless otherwise approved. The pit shall be accessible and located such that all drainage flows into the pit by gravity. The sump pit shall be constructed of tile, concrete, steel, plastic or other approved materials. The pit bottom shall be solid and provide permanent support for the pump. The sump pit shall be fitted with a gas-tight removable cover that is installed flush with grade or floor level, or above grade or floor level. The cover shall be adequate to support anticipated loads in the area of use. The sump pit shall be vented in accordance with Chapter 9.

712.3.3 Discharge pipe ~~ing~~ and fittings. Discharge pipe ~~ing~~ and fittings serving sump pumps and ejectors shall be constructed of materials in accordance with Sections 712.3.3.1 and 712.3.3.2 and shall be approved. ~~shall meet the requirements of Section 712.2.~~

712.3.3.1 Materials. Pipe and fitting materials shall be constructed of brass, copper, CPVC, ductile iron, PE, or PVC.

712.3.3.2 Ratings. Pipe and fittings shall be rated for the maximum system operating pressure and temperature. Pipe fitting materials shall be compatible with the pipe material. Where pipe and fittings are buried in the earth, they shall be suitable for burial.

712.3.4 Maximum effluent level. The effluent level control shall be adjusted and maintained to at all times prevent the effluent in the sump from rising to within 2 inches (51 mm) of the invert of the gravity drain inlet into the sump.

712.3.5 ~~Pump/Ejector~~ connection to the drainage system. Pumps connected to the drainage system shall connect to the building sewer building drain, soil stack, waste stack or horizontal branch drain. Where the discharge line

~~connects into horizontal drainage piping, the connection shall be made through or shall connect to a wye fitting into the top of the drainage piping and such wye fitting shall be located not less than 10 pipe diameters from the base of any soil stack, waste stack or fixture drain in the building drain a minimum of 10 feet (3048 mm) from the base of any soil stack, waste stack or fixture drain. Where the discharge line connects into horizontal drainage piping, the connector shall be made through a wye fitting into the top of the drainage piping.~~

712.4 Sewage pumps and sewage ejectors. A sewage pump or sewage ejector shall automatically discharge the contents of the sump to the building drainage system.

712.4.1 Macerating toilet systems. Macerating toilet systems shall comply with CSA B45.9 ~~or~~ ASME A112.3.4 and shall be installed in accordance with the manufacturer's installation instructions.

712.4.2 Capacity. A sewage pump or sewage ejector shall have the capacity and head for the application requirements. Pumps or ejectors that receive the discharge of water closets shall be capable of handling spherical solids with a diameter of up to and including 2 inches (51 mm). Other pumps or ejectors shall be capable of handling spherical solids with a diameter of up to and including 1 inch (25.4 mm). The ~~minimum~~ capacity of a pump or ejector based on the diameter of the discharge pipe shall be in accordance with Table 712.4.2.

Exceptions:

Grinder pumps or grinder ejectors that receive the discharge of water closets shall have a minimum discharge opening of ~~1.25~~ $1\frac{1}{4}$ inches (32 mm).

Macerating toilet assemblies that serve single water closets shall have a minimum discharge opening of ~~0.75~~ $\frac{3}{4}$ inch (19 mm).

**TABLE 712.4.2
MINIMUM CAPACITY OF SEWAGE PUMP OR SEWAGE
EJECTOR**

DIAMETER OF THE DISCHARGE PIPE (inches)	CAPACITY OF PUMP OR EJECTOR (gpm)
2	21
2½	30
3	46

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

SECTION 713

DELETED

HEALTH CARE PLUMBING [A22]

713.1 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 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.

713.2 Bedpan washers and clinical sinks. Bedpan washers and clinical sinks shall connect to the drainage and vent system in accordance with the requirements for a water closet. Bedpan washers shall also connect to a local vent.

713.3 Indirect waste. Sterilizers, steamers and condensers shall discharge to the drainage through an indirect waste pipe by means of an air gap. Where a battery of not more than three sterilizers discharges to an individual receptor, the distance between the receptor and a sterilizer shall not exceed 8 feet (2438 mm). The indirect waste pipe on a bedpan steamer shall be trapped.

713.4 Vacuum system station. Ready access shall be provided to vacuum system station receptacles. Such receptacles shall be built into cabinets or recesses and shall be visible.

713.5 Bottle system. Vacuum (fluid suction) systems intended for collecting, removing and disposing of blood, pus or other fluids by the bottle system shall be provided with receptacles equipped with an overflow prevention device at each vacuum outlet station.

713.6 Central disposal system equipment. All central vacuum (fluid suction) systems shall provide continuous service. Systems equipped with collecting or control tanks shall provide for draining and cleaning of the tanks while the system is in operation. In hospitals, the system shall be connected to the emergency power system. The exhausts from a vacuum pump serving a vacuum (fluid suction) system shall discharge separately to open air above the roof.

713.7 Central vacuum or disposal systems. Where the waste from a central vacuum (fluid suction) system of the barometric lag, collection tank or bottle disposal type is connected to the drainage system, the waste shall be directly connected to the sanitary drainage system through a trapped waste.

713.7.1 Piping. The piping of a central vacuum (fluid suction) system shall be of corrosion resistant material with a smooth interior surface. A branch shall not be less than 0.5-inch (12.7 mm) nominal pipe size for one outlet and shall be sized in accordance with the number of vacuum outlets. A main shall not be less than 1-inch (25 mm) nominal pipe size. The pipe sizing shall be increased in accordance with the manufacturer's instructions as stations are increased.

713.7.2 Velocity. The velocity of airflow in a central vacuum (fluid suction) system shall be less than 5,000 feet per minute (25 m/s).

713.8 Vent connections prohibited. Connections between local vents serving bedpan washers or sterilizer vents serving sterilizing apparatus and normal sanitary plumbing systems are prohibited. Only one type of apparatus shall be served by a local vent.

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713.9 Local vents and stacks for bedpan washers. Bedpan washers shall be vented to open air above the roof by means of one or more local vents. The local vent for a bedpan washer shall not be less than a 2-inch diameter (51 mm) pipe. A local vent serving a single bedpan washer is permitted to drain to the fixture served.

713.9.1 Multiple installations. Where bedpan washers are located above each other on more than one floor, a local vent stack is permitted to be installed to receive the local vent on the various floors. Not more than three bedpan washers shall be connected to a 2-inch (51 mm) local vent stack, not more than six to a 3-inch (76 mm) local vent stack and not more than 12 to a 4-inch (102 mm) local vent stack. In multiple installations, the connections between a bedpan washer local vent and a local vent stack shall be made with tee or tee wye sanitary pattern drainage fittings installed in an upright position.

713.9.2 Trap required. The bottom of the local vent stack, except where serving only one bedpan washer, shall be drained by means of a trapped and vented waste connection to the sanitary drainage system. The trap and waste shall be the same size as the local vent stack.

713.9.3 Trap seal maintenance. A water supply pipe not less than $\frac{1}{4}$ inch (6.4 mm) in diameter shall be taken from the flush supply of each bedpan washer on the discharge or fixture side of the vacuum breaker, shall be trapped to form not less than a 3-inch (76 mm) water seal, and shall be connected to the local vent stack on each floor. The water supply shall be installed to provide a supply of water to the local vent stack for cleansing and drain trap seal maintenance each time a bedpan washer is flushed.

713.10 Sterilizer vents and stacks. Multiple installations of pressure and nonpressure sterilizers shall have the vent connections to the sterilizer vent stack made by means of inverted-wye fittings. Access shall be provided to vent connections for inspection and maintenance.

713.10.1 Drainage. The connection between sterilizer vent or exhaust openings and the sterilizer vent stack shall be designed and installed to drain to the funnel or basket type waste fitting. In multiple installations, the sterilizer vent stack shall be drained separately to the lowest sterilizer funnel or basket type waste fitting or receptor.

713.11 Sterilizer vent stack sizes. Sterilizer vent stack sizes shall comply with Sections 713.11.1 through 713.11.4.

713.11.1 Bedpan steamers. The minimum size of a sterilizer vent serving a bedpan steamer shall be 1.50 inches (38 mm) in diameter. Multiple installations shall be sized in accordance with Table 713.11.1.

713.11.2 Boiling type sterilizers. The minimum size of a sterilizer vent stack shall be 2 inches (51 mm) in diameter where serving a utensil sterilizer and 1.5 inches (38 mm) in diameter where serving an instrument sterilizer. Combinations of boiling type sterilizer vent connections shall be sized in accordance with Table 713.11.1.

713.11.3 Pressure sterilizers. Pressure sterilizer vent stacks shall be 2.5 inches (64 mm) minimum. Those serving

combinations of pressure sterilizer exhaust connections shall be sized in accordance with Table 713.11.3.

713.11.4 Pressure instrument washer sterilizer sizes. The minimum diameter of a sterilizer vent stack serving an instrument washer sterilizer shall be 2 inches (51 mm). Not more than two sterilizers shall be installed on a 2-inch (51 mm) stack, and not more than four sterilizers shall be installed on a 3-inch (76 mm) stack.

TABLE 713.11.1
STACK SIZES FOR BEDPAN STEAMERS AND
BOILING-TYPE STERILIZERS
(Number of Connections of Various Sizes Permitted to Various-sized Sterilizer Vent Stacks)

STACK SIZE (inches)	CONNECTION SIZE	
	$1\frac{1}{2}$	2
$1\frac{1}{2}$ ^a	1	or 0
2 ^a	2	or 1
2 ^b	1	and 1
3 ^a	4	or 2
3 ^b	2	and 2
4 ^a	8	or 4
4 ^b	4	and 4

For SI: 1 inch = 25.4 mm.
Total of each size.
Combination of sizes.

TABLE 713.11.3
STACK SIZES FOR PRESSURE STERILIZERS
(Number of Connections of Various Sizes Permitted To Various-sized Vent Stacks)

STACK SIZE (inches)	CONNECTION SIZE			
	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$
$1\frac{1}{2}$ ^a	3-or	2-or	1	—
$1\frac{1}{2}$ ^b	2-and	1	—	—
2 ^a	6-or	3-or	2-or	1
2 ^b	3-and	2	—	—
2 ^b	2-and	1-and	1	—
2 ^b	1-and	1-and	—	1
3 ^a	15-or	7-or	5-or	3
3 ^b	1-and	1-and 5-and	2-and	2 1

For SI: 1 inch = 25.4 mm.
Total of each size.
Combination of sizes.

SECTION 714 Deleted

SECTION 7145 BACKWATER VALVES

7145.1 Sewage backflow. Where the flood level rims of plumbing fixtures are installed on a floor with finished floor

elevation below the elevation of the manhole cover of the next upstream manhole in the public sewer, such fixtures shall be protected by a backwater valve installed in the building drain, ~~sewer branch of the building drain~~ or horizontal branch serving such fixtures. Plumbing fixtures installed on a floor with a finished floor elevation above having flood level rims above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve unless determined by the administrative authority that one is needed.

7145.2 Material. ~~All bearing parts of backwater valves shall be of corrosion resistant material.~~ Backwater valves shall comply with ASME A112.14.1, CSA B181.1 or CSA B181.2.

715.3 Seal. ~~Backwater valves shall be so constructed as to provide a mechanical seal against backflow.~~

715.4 Diameter. ~~Backwater valves, when fully opened, shall have a capacity not less than that of the pipes in which they are installed.~~

7145.5 Location. Backwater valves shall be installed so that access is provided to the working parts, ~~for service and repair.~~

SECTION G404715

VACUUM DRAINAGE SYSTEMS

(NOTE: plumbing license not required to install vacuum portion of Vacuum Drainage Systems)

715.1 Scope. Vacuum drainage systems shall be in accordance with Sections 716.2 through 716.4.

G101.2 General requirements.

715.2 G101.2.1 System design. Vacuum drainage systems shall be designed in accordance with the vacuum drainage system manufacturer's instructions recommendations. The system layout, including piping layout, tank assemblies, vacuum pump assembly and other components necessary for proper function of the system shall be in accordance with the manufacturer's instructions recommendations. Plans, specifications and other data for such systems shall be submitted to the code official for review and approval prior to installation.

715.2.1 G101.2.2 Fixtures. Gravity-type fixtures installed in vacuum drainage systems shall comply with Chapter 4 ~~of this code~~.

715.2.2 G101.2.3 Drainage fixture units. Drainage Fixture fixture units for gravity drainage systems that discharge into, or receive discharge from, vacuum drainage systems shall be based on the values in this chapter.

715.2.3 G101.2.4 Water supply fixture units. Water supply fixture units shall be based on the values in Chapter 6 of this code, with the addition that the fixture unit of except that the water supply fixture unit for a vacuum-type water closet shall be 1.

715.2.4 G101.2.5 Traps and cleanouts. Gravity drainage fixtures shall be provided with traps and cleanouts in accordance with ~~Chapter 7~~ this chapter and Chapter 10.

715.2.5 G101.2.6 Materials. Vacuum drainage pipe, fitting and valve materials shall be ~~as recommended by the vacuum drainage system manufacturer and as permitted by code~~ in accordance with the vacuum drainage system manufacturer's instructions and the requirements of this chapter.

715.3 G101.3 Testing and demonstrations. After completion of the entire system installation, the system shall be subjected to a vacuum test of 19 inches (483 mm) of mercury and shall be operated to function as required by the ~~administrative authority code official~~ and the manufacturer of the vacuum drainage system. Recorded proof of all tests shall be submitted to the ~~administrative authority code official~~ official.

715.4 G101.4 Written instructions. Written instructions for the operation, maintenance, safety and emergency procedures shall be provided to the building owner ~~as verified by the administrative authority~~. The code official shall verify that the building owner is in receipt of such instructions.

SECTION 716 REPLACEMENT OF UNDERGROUND BUILDING SEWERS AND BUILDING DRAINS BY PIPE-BURSTING METHODS

716.1 General. This section shall govern the replacement of existing building sewer and building drain piping by pipe-bursting methods.

716.2 Applicability. The replacement of building sewer and building drain piping by pipe-bursting methods shall be limited to gravity drainage piping of sizes 6 inches (152 mm) and smaller. The replacement piping shall be of the same nominal size as the existing piping.

716.3 Pre-installation inspection. The existing piping sections to be replaced shall be inspected internally by a recorded video camera survey. The survey shall include notations of the position of cleanouts and the depth of connections to the existing piping.

716.4 Pipe. The replacement pipe shall be made of high-density polyethylene (HDPE) and shall have a standard dimension ratio (SDR) of 17. The pipe shall be in compliance with ASTM F714.

716.5 Pipe fittings. Pipe fittings to be connected to the replacement pipe shall be made of high-density polyethylene (HDPE) and shall be in compliance with ASTM D2683.

716.6 Cleanouts. Where the existing building sewer or building drain did not have cleanouts meeting the requirements of this code, cleanout fittings shall be installed as required by this code.

716.7 Post-installation inspection. The completed replacement piping section shall be inspected internally by a recorded video camera survey. The video survey shall be reviewed and approved by the code official prior to pressure testing of the replacement piping system.

716.8 Pressure testing. The replacement piping system as well as the connections to the replacement piping shall be tested in accordance with Section 312.

CHAPTER 8

INDIRECT/SPECIAL WASTE

User note:

About this chapter: There are drainage applications in buildings where a backup of liquid waste in a drainage system could contaminate equipment and appliances. Chapter 8 covers the applications that require an indirect discharge connection to the building's drainage system. The chapter has provisions for the types of indirect connections and waste receptor configurations.

SECTION 801 GENERAL

801.1 Scope. This chapter shall govern matters concerning indirect waste piping and special wastes. This chapter shall further control matters concerning food-handling establishments, sterilizers, humidifiers, clear-water wastes, swimming pools, methods of providing air breaks or air gaps, and neutralizing devices for corrosive wastes.

801.2 Protection. ~~All~~ Devices, appurtenances, appliances and apparatus intended to serve some special function, such as sterilization, humidification, distillation, processing, cooling, or storage of ice or foods, and that discharge to the drainage system, shall be provided with protection against backflow, flooding, fouling, contamination and stoppage of the drain.

SECTION 802 INDIRECT WASTES

802.1 Where required. Food-handling equipment, in other than dwelling units, and clear-water waste, humidifiers, dishwashing machines and utensils, pots, pans and dishwashing sinks shall discharge through an indirect waste pipe as specified in Sections 802.1.1 through 802.1.87. ~~All health care related fixtures, devices and equipment shall discharge to the drainage system through an indirect waste pipe by means of an air gap in accordance with this chapter and Section 713.3.~~ [A23] Fixtures not required by this section to be indirectly connected shall be directly connected to the plumbing system in accordance with Chapter 7.

802.1.1 Food handling. Equipment and fixtures utilized for the storage, preparation and handling of food shall discharge through an indirect waste pipe by means of an air gap [A24].

802.1.2 Floor drains in food storage areas. Floor drains located within walk-in refrigerators or freezers in food service and food establishments shall be indirectly connected to the sanitary drainage system by means of an air gap. Where a floor drain is located within an area subject to freezing, the waste line serving the floor drain shall not be trapped and shall indirectly discharge into a waste receptor located outside of the area subject to freezing.

Exception: Where protected against backflow by a backwater valve, such floor drains shall be indirectly

connected to the sanitary drainage system by means of an air break or an air gap.

802.1.3 Potable clear-water waste. Where devices and equipment, such as sterilizers and relief valves, discharge potable water to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air gap.

802.1.4 Swimming pools. Where wastewater from swimming pools, backwash from filters and water from pool deck drains discharge to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air gap.

802.1.5 Nonpotable clear-water waste. Where devices and equipment such as process tanks, filters, drips and boilers discharge nonpotable water to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air break or an air gap.

~~**802.1.6 Domestic Dishwashing machines.** Domestic dishwashing machines shall discharge indirectly through an air gap or air break into a standpipe or waste receptor in accordance with Section 802.2, or discharge into a wye branch fitting on the tailpiece of the kitchen sink or the dishwasher connection of a food waste grinder. The waste line of a domestic dishwashing machine discharging into a kitchen sink tailpiece or food waste grinder shall connect to a deck mounted air gap or the waste line shall rise and be securely fastened to the underside of the sink rim or counter.~~

802.1.67 Commercial dishwashing machines. The discharge from a commercial dishwashing machine shall be through an air gap or air break into a standpipe or waste receptor in accordance with Section 802.2 [A25].

802.2 Material, joints and connections. The materials, joints, connections and methods utilized for the construction and installation of indirect waste piping systems shall comply with the applicable provisions of Chapter 7.

802.32 Installation. ~~All~~ Indirect waste piping shall discharge through an air gap or air break into a waste receptor. ~~of standpipe.~~ Waste receptors ~~and standpipes~~ shall be trapped and

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vented and shall connect to the building drainage system. ~~All indirect waste piping that exceeds 2 feet (610 mm) 30 inches (762 mm) in developed length measured horizontally, or 4 feet (1219 mm) 54 inches (1372 mm) in total developed length, shall be trapped.~~

Exception: Where a waste receptor receives only clear-water waste and does not directly connect to a sanitary drainage system, the receptor shall not require a trap.

802.32.1 Air gap. The air gap between the indirect waste pipe and the flood level rim of the waste receptor shall be a minimum of twice the effective opening of the indirect waste pipe.

802.32.2 Air break. An air break shall be provided between the indirect waste pipe and the trap seal of the waste receptor. ~~or standpipe~~

802.43 Waste receptors. ~~For other than hub drains that receive only clear-water waste and standpipes Every waste receptor shall be of an approved type. A removable strainer or basket shall cover the waste outlet of waste receptors. Waste receptors shall not be installed in ventilated concealed spaces. Waste receptors shall not be installed in plenums, crawlspaces, attics, interstitial spaces above ceilings and below floors. bathrooms or toilet rooms or in any inaccessible or unventilated space such as a closet or storeroom.~~ Ready access shall be provided to waste receptors.

802.43.1 Size of receptors. A waste receptor shall be sized for the maximum discharge of all indirect waste pipes served by the receptor. Receptors shall be installed to prevent splashing or flooding.

802.43.2 Open hub waste receptors. ~~Hub Drains~~ ~~Waste receptors~~ A hub drain shall be permitted in the form of a hub or pipe extending not less than 1 inch (25.4 mm) above a water-impervious floor ~~and are not required to have a strainer.~~

802.4.3 Standpipes. Standpipes shall be individually trapped. Standpipes shall extend ~~a minimum of not less than~~ 18 inches (457 mm) ~~and a maximum of but not greater than~~ 42 inches (1066 mm) above the trap weir. Access shall be provided to all standpipes and drains for rodding.

802.4.3.1 Connection of laundry tray to standpipe. ~~As an alternative for a laundry tray fixture connecting directly to a drainage system, a laundry tray waste line without a fixture trap shall connect to a standpipe for an automatic clothes washer drain. The standpipe shall extend not less than 30 inches (732 mm) above the weir of the standpipe trap and shall extend above the flood level rim of the laundry tray. The outlet of the laundry tray shall not be greater than 30 inches (762 mm) horizontal distance from the side of the standpipe.~~

SECTION 803 SPECIAL WASTES

803.1 Wastewater temperature. ~~Steam pipes shall not connect to any part of a drainage or plumbing system and water above 140°F (60°C) shall not be discharged into any part of a drainage system. Such pipes shall discharge into an indirect waste receptor connected to the drainage system.~~

803.2-1 Neutralizing device required for corrosive wastes. Corrosive liquids, spent acids or other harmful chemicals that destroy or injure a drain, sewer, soil or waste pipe, or create noxious or toxic fumes or interfere with sewage treatment processes shall not be discharged into the plumbing system without being thoroughly diluted, neutralized or treated by passing through an approved dilution or neutralizing device. Such devices shall be automatically provided with a sufficient supply of diluting water or neutralizing medium so as to make the contents noninjurious before discharge into the drainage system. The nature of the corrosive or harmful waste and the method of its treatment or dilution shall be approved prior to installation.

803.3.2 System design. A chemical drainage and vent system shall be designed and installed in accordance with this code. Chemical drainage and vent systems shall be completely separated from the sanitary systems. Chemical waste shall not discharge to a sanitary drainage system until such waste has been treated in accordance with Section 803.12.

SECTION 804 MATERIALS, JOINTS AND CONNECTIONS

804.1 General. ~~The materials and methods utilized for the construction and installation of indirect waste pipes and systems shall comply with the applicable provisions of Chapter 7.~~ [A26]

CHAPTER 9 VENTS

User note:

About this chapter: Chapter 9 regulates connection locations, various venting system arrangements and the sizing of piping for vent systems. The proper operation of a gravity flow drainage system (Chapter 7) depends on maintaining an air path throughout the system to prevent waste and odor "blow back" into fixtures and siphoning of the trap seal in fixture traps (Chapter 10).

SECTION 901 GENERAL

901.1 Scope. The provisions of this chapter shall govern the materials, design, construction and installation of vent systems.

901.2 Trap seal protection. The plumbing system shall be provided with a system of vent piping that will permit the admission or emission of air so that the seal of any fixture trap shall not be subjected to a pneumatic pressure differential of more than 1 inch of water column (249 Pa).

901.2.1 Venting required. ~~Every~~ Traps and trapped fixtures shall be vented in accordance with one of the venting methods specified in this chapter.

901.3 Chemical waste vent system. The vent system for a chemical waste system shall be independent of the sanitary vent system and shall terminate separately through the roof to the outdoors or to an air admittance valve that complies with ASSE 1049. Air admittance valves for chemical waste systems shall be constructed of materials approved in accordance with Section 702.5 and shall be tested for chemical resistance in accordance with ASTM F 1412. ~~open air.~~

901.4 Use limitations. The plumbing vent system shall not be utilized for purposes other than the venting of the plumbing system.

901.5 Tests. The vent system shall be tested in accordance with Section 312.

SECTION 902 MATERIALS

902.1 Vents. The materials and methods utilized for the construction and installation of venting systems shall comply with the applicable provisions of Section 702.

902.2 Sheet copper. Sheet copper for vent pipe flashings shall conform to ASTM B 152 and shall weigh not less than 8 ounces per square foot (2.5 kg/m²).

902.3 Sheet lead. Sheet lead for vent pipe flashings shall weigh not less than 3 pounds per square foot (15 kg/m²) for field-constructed flashings and not less than ~~2.5~~ 2 1/2 pounds per square foot (12 kg/m²) for prefabricated flashings.

SECTION 903.4 VENT TERMINALS

903.1 4.1 Roof extension. ~~All~~ Open vent pipes that extend through a roof shall be terminated not less than at least 6 inches (152 mm) above the roof. Where a roof is to be used for assembly or as a promenade, observation deck, sunbathing deck or similar purposes, open vent pipes shall terminate not less than, except that where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 7 feet (2134 mm) above the roof.

903.2 4.2 Frost closure. Where the 97.5-percent value for outside design temperature is 0° F (-18° C) or less, every vent extension through a roof or wall shall be ~~a~~ not less than minimum of 3 inches (76 mm) in diameter. Any increase in the size of the vent shall be made not less than 1 foot (305 mm) inside the thermal envelope of the building, inside the structure a minimum of 1 foot (305 mm) below the roof or inside the wall.

903.3 4.3 Flashings. The juncture of each vent pipe with the roof line shall be made water tight by an approved flashing.

903.4 4.4 Prohibited use. ~~A vent terminal shall not be used for any purpose other than a vent terminal. Vent terminals shall not be used as a flag pole or to support flag poles, television aerials or similar items, except when the piping has been anchored in an approved manner.~~

903.5 4.5 Location of vent terminal. An open vent terminal from a drainage system shall not be located directly beneath any door, openable window, or other air intake opening of the building or of an adjacent building, and any such vent terminal shall not be within 10 feet (3048 mm) horizontally of such an opening unless it is at least 3.2 feet (914.610 mm) or more above the top of such opening.

903.6 4.6 Extension through the wall. Vent terminals extending through the wall shall terminate not less than a minimum of 10 feet (3048 mm) from the lot line and not less than 10 feet (3048 mm) above average ground level. Vent terminals shall not terminate under the overhang of a structure with soffit vents. Side wall vent terminals shall be protected to prevent birds or rodents from entering or blocking the vent opening.

903.7 4.7 Extension outside a structure. In climates where the 97.5-percent value for outside design temperature is less than 0° F (-18° C), vent pipes installed on the exterior of the structure shall be protected against freezing by insulation, heat or both.

SECTION 904.3 OUTDOOR VENT EXTENSIONS VENT STACKS AND STACK VENTS

904.1 3.1 Stack required. Required vent extension. The vent system serving each *building drain* shall have not less than one vent pipe that extends to the outdoors. Every building in which plumbing is installed shall have at least one 3-inch minimum (76 mm) vent stack or stack vent. Such stack shall run undiminished in size and as directly as possible from the building drain through to the open air or to a vent header that extends to the open air.

904.1.1 3.1.1 Installation. The required vent shall be a vent that connects to the building drain or an extension of a drain that connects to the building drain. Such vent shall not be an island fixture vent as allowed by Section 912.2.916

904.1.2 Size. The required vent shall be sized in accordance with Section 906.2 based on the required size of the *building drain*. Every plumbing system shall have at least one 2-inch (51mm) vent running undiminished in size as directly as possible to the open air. [A27]

904.2 3.2 Vent stack required. A vent stack shall be required for every drainage stack that is five branch intervals or more.

Exception: Drainage stacks installed in accordance with Section 913

904.3 3.3 Vent termination. Every ~~v~~ Vent stacks or stack vents shall ~~extend outdoors and~~ terminate to the open air ~~or to a stack-type air admittance valve in accordance with Section 917.~~

904.4 3.4 Vent connection at base. Every ~~v~~ Vent stack shall connect to the base of the drainage stack. The vent stack shall connect at or below the lowest horizontal branch. Where the vent stack connects to the building drain, the connection shall be located downstream of the drainage stack and within a distance of 10 times the diameter of the drainage stack.

904.5 3.5 Vent headers. Stack vents and vent stacks connected into a common vent header at the top of the stacks and extending to the open air at one point shall be sized in accordance with the requirements of Section 906.1 46.1. The number of fixture units shall be the sum of all fixture units on all stacks connected thereto, and the developed length shall be the longest vent length from the intersection at the base of the most distant stack to the vent terminal in the open air, as a direct extension of one stack.

SECTION 905 VENT CONNECTIONS AND GRADES

905.1 Connection. All ~~i~~ Individual, branch and circuit vents shall connect to a vent stack, stack vent, air admittance valve or extend to the open air.

905.2 Grade. All ~~v~~ Vent and branch vent pipes shall be so graded and connected as to drain back to the drainage pipe by gravity.

905.3 Vent connection to drainage system. ~~Where Every dry vent pipes connecting to a horizontal drain soil or waste pipe, the vent shall connect be taken above the centerline of the horizontal drain soil or waste pipe, and the vent pipe shall rise vertically, or at an angle not greater than 67.5 degrees (1.18 rad) from the vertical to a point at least 6 inches (152 mm) above the soil or waste pipe, before offsetting horizontally.~~

905.4 Vertical rise of vent. ~~Where Every dry vent pipes connect to a vertical soil or waste pipe, the vent shall rise vertically to a point no less than 6 inches (152 mm) above the flood rim of the highest trap or trapped fixture being vented, unless otherwise approved by the administrative authority. [A28] served before offsetting horizontally.~~

Exception: Vents for interceptors located outdoors.

905.5 Height above fixtures. A connection between a vent pipe and a vent stack or stack vent shall be made at least 6 inches (152mm) above the flood level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents, relief vents or loop vents shall ~~be located not be at least less than~~ 6 inches (152 mm) above the flood level rim of the highest fixture served.

905.6 Vent for future fixtures. Where the drainage piping has been roughed-in for future fixtures, a rough-in connection for a vent shall be installed. The vent size shall be not less than one-half the diameter of the rough-in drain to be served. The vent rough-in shall connect to the vent system, or shall be vented by other means as provided for in this chapter. The connection shall be identified to indicate that it is a vent.

905.7 Venting of fixture drains. ~~The total fall in a fixture drain due to pipe slope shall not exceed the diameter of the fixture drain, nor shall the vent connect to a fixture drain, except for water closets, below the weir of the trap. [RM29]~~

SECTION 906.46 VENT PIPE SIZING

906.16.1 Size of stack vents and vent stacks. The minimum required diameter of stack vents and vent stacks shall be determined from the developed length and the total of drainage fixture units connected thereto in accordance with Table 906.46.1, but in no case shall the diameter be less than one-half the diameter of the drain served or less than 1 1/4 inches (32 mm). The minimum size vent installed underground, or below a basement, cellar or slab, shall not be less than 2 inches (51 mm) in diameter. [A30]

906.16.2 Vents other than stack vents or vent stacks. The diameter of individual vents, branch vents, circuit vents and relief vents shall be at least one-half the required diameter of the drain served. The required size of the drain shall be determined in accordance with Table 710.1(2). Vent pipes shall not be less than 1 1/4 inches (32 mm) in diameter. Vents exceeding 40 feet (12 192 mm) in developed length shall be increased by one nominal pipe size for the entire developed length of the vent pipe. Relief vents for soil and waste stacks in buildings having

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more than 10 branch intervals shall be sized in accordance with Section 908.2.14.2.

90616.3 Developed length. The developed length of individual, branch, circuit and relief vents shall be measured from the farthest point of vent connection to the drainage system to the point of connection to the vent stack, stack vent or termination outside of the building.

90616.4 Multiple branch vents. Where multiple branch vents are connected to a common branch vent, the common branch vent shall be sized in accordance with this section based on the size of the common horizontal drainage branch that is or would be required to serve the total drainage fixture unit (dfu) load being vented.

916.4.1 Branch vents exceeding 40 feet in developed length. Branch vents exceeding 40 feet (12 192 mm) in developed length shall be increased by one nominal size for the entire developed length of the vent pipe [RM31].

906 16.5 Sump vents. Sump vent sizes shall be determined in accordance with Sections 906 16.5.1 and 906 16.5.2.

906 16.5.1 Sewage pumps and sewage ejectors other than pneumatic. Drainage piping below sewer level shall be vented in a similar manner to that of a gravity system. Building sump vent sizes for sumps with sewage pumps or sewage ejectors, other than pneumatic, shall be determined in accordance with Table 906 16.5.1

90616.5.2 Pneumatic sewage ejectors. The air pressure relief pipe from a pneumatic sewage ejector shall be connected to an independent vent stack terminating as required for vent extensions through the roof. The relief pipe shall be sized to relieve air pressure inside the ejector to atmospheric pressure, but shall not be less than 1 1/4 inches (32 mm) in size.

SECTION 907 15 VENTS FOR STACK OFFSETS

90715.1 Vent for horizontal offset of drainage stack. Horizontal offsets of drainage stacks shall be vented where five or more branch intervals are located above the offset. The offset shall be vented by venting the upper section of the drainage stack and the lower section of the drainage stack.

90715.2 Upper section. The upper section of the drainage stack shall be vented as a separate stack with a vent stack connection installed in accordance with Section 9043.4. The offset shall be considered the base of the stack.

90715.3 Lower section. The lower section of the drainage stack shall be vented by a yoke vent connecting between the offset and the next lower horizontal branch. The yoke vent connection shall be permitted to be a vertical extension of the drainage

stack. The size of the yoke vent and connection shall be a minimum of the size required for the vent stack of the drainage stack.

SECTION 908 44 RELIEF VENTS—STACKS OF MORE THAN 10 BRANCH INTERVALS

90814.1 Where required. Soil and waste stacks in buildings having more than 10 branch intervals shall be provided with a relief vent at each tenth interval installed, beginning with the top floor.

90814.2 Size and connection. The size of the relief vent shall be equal to the size of the vent stack to which it connects. The lower end of each relief vent shall connect to the soil or waste stack through a wye below the horizontal branch serving the floor, and the upper end shall connect to the vent stack through a wye not less than 3 feet (914 mm) above the floor.

SECTION 909 6 FIXTURE VENTS

9096.1 Distance of trap from vent. Each fixture trap shall have a protecting vent located so that the slope and the developed length in the fixture drain from the trap weir to the vent fitting are within the requirements set forth in Table 9096.1.

Exception: The developed length of the fixture drain from the trap weir to the vent fitting for self-siphoning fixtures, such as water closets, shall not be limited.

909 6.2 Venting of fixture drains. The vent for a fixture drain, except where serving a fixture with integral traps, such as water closets, shall connect above the weir of the fixture trap being vented.

909 6.3 Crown vent. A vent shall not be installed within two pipe diameters of the trap weir.

SECTION 910 07 INDIVIDUAL VENT

91007.1 Individual vent permitted. Each trap and trapped fixture is permitted to be provided with an individual vent. The individual vent shall connect to the fixture drain of the trap or trapped fixture being vented.

SECTION 911 08 COMMON VENT

91108.1 Individual vent as common vent. An individual vent is permitted to vent two traps or trapped fixtures as a common vent. The traps or trapped fixtures being common vented shall be located on the same floor level.

91108.2 Connection at the same level. Where the fixture drains being common vented connect at the same level, the vent connection shall be at the interconnection of the fixture drains or downstream of the interconnection.

91108.3 Connection at different levels. Where the fixture drains connect at different levels, the vent shall connect as a vertical extension of the vertical drain. The vertical drain pipe connecting the two fixture drains shall be considered the vent for the lower fixture drain, and shall be sized in accordance with Table 91108.3. The upper fixture shall not be a water closet.

TABLE 906.1 16.4
SIZE AND DEVELOPED LENGTH OF STACK VENTS AND VENT STACKS

DIAMETER OF SOIL OR WASTE STACK (inches)	TOTAL FIXTURE UNITS BEING VENTED (dfu)	MAXIMUM DEVELOPED LENGTH OF VENT (feet) ^a										
		DIAMETER OF VENT (inches)										
		1 ¹ / ₄	1 ¹ / ₂	2	2 ¹ / ₂	3	4	5	6	8	10	12
1 ¹ / ₄	2	30										
1 ¹ / ₂	8	50	150	—	—	—	—	—	—	—	—	—
1 ¹ / ₂	10	30	100									
2	12	30	75	200								
2	20	30 26	50	150		—	—	—	—	—	—	—
2 ¹ / ₂	42	26	30	100	300							
3	10		42	150	360	1,040						
3	21	—	32	110	270	810		—	—	—	—	—
3	53		27	94	230	680						
3	102		25	86	210	620						
4	43	—	25	35	85	250	980			—	—	—
4	140			27	65	200	750					
4	320			23	55	170	640					
4	540	—	—	21	50	150	580		—	—	—	—
5	190				28	82	320	990				
5	490				21	63	250	760				
5	940	—	—	—	18	53	210	670	—	—	—	—
5	1,400				16	49	190	590				
6	500					33	130	400	1,000			
6	1,100	—	—	—	—	26	100	310	780	—	—	—
6	2,000					22	84	260	660			
6	2,900					20	77	240	600			
8	1,800	—	—	—	—		31	95	240	940	—	—
8	3,400						24	73	190	720		
8	5,600						20	62	160	610		
8	7,600	—	—	—	—	—	18	56	140	560		—
10	4,000							31	78	310	960	
10	7,200							24	60	240	740	
10	11,000	—	—	—	—	—		20	51	200	630	—
10	15,000							18	46	180	570	
12	7,300								31	120	380	940
12	13,000	—	—	—	—	—	—	—	24	94	300	720
12	20,000								20	79	250	610
12	26,000								18	72	230	500
15	15,000	—	—	—	—	—	—	—		40	130	310
15	25,000									31	96	240
15	38,000	—	—	—	—	—	—	—	—	26	81	200
15	50,000									24	74	180

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. The developed length shall be measured from the vent connection to the open air.

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**TABLE 906.16.5.1
SIZE AND LENGTH OF SUMP VENTS**

DISCHARGE CAPACITY OF PUMP (gpm)	MAXIMUM DEVELOPED LENGTH OF VENT (feet) ^a					
	Diameter of vent (inches)					
	1 ¹ / ₄	1 ¹ / ₂	2	2 ¹ / ₂	3	4
10	No limit ^b	No limit	No limit	No limit	No limit	No limit
20	270	No limit	No limit	No limit	No limit	No limit
40	72	160	No limit	No limit	No limit	No limit
60	31	75	270	No limit	No limit	No limit
80	16	41	150	380	No limit	No limit
100	10 ^c	25	97	250	No limit	No limit
150	Not permitted	10 ^c	44	110	370	No limit
200	Not permitted	Not permitted	20	60	210	No limit
250	Not permitted	Not permitted	10	36	132	No limit
300	Not permitted	Not permitted	10 ^c	22	88	380
400	Not permitted	Not permitted	Not permitted	10 ^c	44	210
500	Not permitted	Not permitted	Not permitted	Not permitted	24	130

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

Developed length plus an appropriate allowance for entrance losses and friction due to fittings, changes in direction and diameter. Suggested allowances shall be obtained from NSB Monograph 31 or other approved sources. An allowance of 50 percent of the developed length shall be assumed if a more precise value is not available.

Actual values greater than 500 feet.
Less than 10 feet.

**TABLE 909.6.1
MAXIMUM DISTANCE OF FIXTURE
TRAP FROM VENT**

SIZE OF TRAP (inches)	SLOPE (inch per foot)	DISTANCE FROM TRAP (feet)
1 ¹ / ₄	¹ / ₄	5
1 ¹ / ₂	¹ / ₄	6
2	¹ / ₄	8
3	¹ / ₈	12
4	¹ / ₈	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 inch per foot = 83.3 mm/m.

**TABLE 9108.3
COMMON VENT SIZES**

PIPE SIZE (inches)	MAXIMUM DISCHARGE FROM UPPER FIXTURE DRAIN (dfu)
1 ¹ / ₂	1
2	4
2 ¹ / ₂ to 3	6

For SI: 1 inch = 25.4 mm. For SI: 1 inch = 25.4 mm.

SECTION 912.09 WET VENTING

91209.1 Horizontal Wet vent permitted. Any combination of fixtures within two bathroom groups located on the same floor level are permitted to be vented by a horizontal wet vent. The wet vent shall be considered the vent for the fixtures and shall extend from the connection of the dry vent along the

direction of the flow in the drain pipe to the most downstream fixture drain connection to the horizontal branch drain. Only the fixtures within the bathroom groups shall connect to the wet-vented horizontal branch drain. Any additional fixtures shall discharge downstream of the wet vent.

91209.1.1 Vertical wet vent permitted. Any combination of fixtures within two bathroom groups located on the same floor level is permitted to be vented by a vertical wet vent. The vertical wet vent shall be considered the vent for the fixtures and shall extend from the connection to the dry vent down to the lowest fixture drain connection. Each fixture shall connect independently to the vertical wet vent. Water closet drains shall connect at the same elevation. Other fixture drains shall connect above or at the same elevation as the water closet fixture drains. The dry vent connection to the vertical wet vent shall be an individual or common vent serving one or two fixtures.

912.2 Dry vent connection. The required dry-vent connection for wet-vented systems shall comply with Sections 912.2.1 and 912.2.2.

91209.2.1 Vent connection. Horizontal wet vent. -The dry-vent connection to the horizontal wet vent shall be an individual vent or common vent for any bathroom group fixture, except an emergency floor drain, to the lavatory, bidet, shower or bathtub. Where the dry-vent connects to a water closet fixture drain, the drain shall connect horizontally to the horizontal wet-vent system. In [RM32]vertical wet-vent systems, the most upstream fixture drain connection shall be a dry-vented fixture drain connection. In horizontal wet-vent systems, a Not more than one wet-vented fixture drain shall discharge upstream of the dry-vented fixture drain connection.

912.2.2 Vertical wet vent. The dry-vent connection for a vertical wet-vent system shall be an individual vent or common vent for the most upstream fixture drain.

91209.3 Size. The dry-vent serving the wet vent shall be sized based on the largest required diameter of pipe within the wet-vent system served by the dry vent. The wet vent shall be of a ~~minimum~~ size not less than that as specified in Table 91209.3, based on the fixture unit discharge to the wet vent.

**TABLE 91209.3
WET VENT SIZE**

WET VENT PIPE SIZE (inches)	DRAINAGE FIXTURE UNIT LOAD (dfu)
1 1/2	1
2	4
2 1/2	6
3	12

For SI: 1 inch = 25.4 mm.

SECTION 913.40 WASTE STACK VENT

91340.1 Waste stack vent permitted. A waste stack shall be considered a vent for all of the fixtures discharging to the stack where installed in accordance with the requirements of this section.

91340.2 Stack installation. The waste stack shall be vertical, and both horizontal and vertical offsets shall be prohibited between the lowest fixture drain connection and the highest fixture drain connection. Every ~~if~~ fixture drains shall connect separately to the waste stack. The stack shall not receive the discharge of water closets or urinals.

91340.3 Stack vent. A stack vent shall be provided for the waste stack. The size of the stack vent shall be not less than the size of the waste stack. Offsets shall be permitted in the stack vent, shall be located not less than at least 6 inches (152 mm) above the flood level of the highest fixture and shall be in accordance with Section 905.2. The stack vent shall be permitted to connect with other stack vents and vent stacks in accordance with Section 9043.5.

91340.4 Waste stack size. The waste stack shall be sized based on the total discharge to the stack and the discharge within a branch interval in accordance with Table 91340.4. The waste stack shall be the same size throughout its length.

SECTION 914.44 CIRCUIT VENTING

9144.1 Circuit vent permitted. ~~A maximum of~~ Not more than eight fixtures connected to a horizontal branch drain shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream fixture drain connection to the most upstream fixture drain connection to the horizontal branch.

9144.1.1 Multiple circuit-vented branches. Circuit-vented horizontal branch drains are permitted to be connected together. Each group of a maximum of eight fixtures shall be

considered a separate circuit vent and shall conform to the requirements of this section.

**TABLE 91340.4
WASTE STACK VENT SIZE**

STACK SIZE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)	
	Total discharge into one branch interval	Total discharge for stack
1 1/2	1	2
2	2	4
2 1/2	No limit	8
3	No limit	24
4	No limit	50
5	No limit	75
6	No limit	100

For SI: 1 inch = 25.4 mm.

9144.2 Vent connection. The circuit vent connection shall be located between the two most upstream fixture drains. The vent shall connect to the horizontal branch and shall be installed in accordance with Section 905. The circuit vent pipe shall not receive the discharge of any soil or waste.

9144.3 Slope and size of horizontal branch. The ~~maximum~~ slope of the vent section of the horizontal branch drain shall be not greater than one unit vertical in 12 units horizontal (8-percent slope). The entire length of the vent section of the horizontal branch drain shall be sized for the total drainage discharge to the branch.

9144.3.1 Size of multiple circuit vent. Each separate circuit-vented horizontal branch that is interconnected shall be sized independently in accordance with Section 9144.3. The downstream circuit-vented horizontal branch shall be sized for the total discharge into the branch, including the upstream branches and the fixtures within the branch.

9144.4 Relief vent. A relief vent shall be provided for circuit-vented horizontal branches receiving the discharge of four or more water closets and connecting to a drainage stack that receives the discharge of soil or waste from upper horizontal branches.

9144.4.1 Connection and installation. The relief vent shall connect to the horizontal branch drain between the stack and the most downstream fixture drain of the circuit vent. The relief vent shall be installed in accordance with Section 905.

9144.4.2 Fixture drain or branch. The relief vent is permitted to be a fixture drain or fixture branch for fixtures located within the same branch interval as the circuit-vented horizontal branch. The maximum discharge to a relief vent shall be four fixture units.

9144.5 Additional fixtures. Fixtures, other than the circuit-vented fixtures, are permitted to discharge to the horizontal branch drain. Such fixtures shall be located on the same

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floor as the circuit-vented fixtures and shall be either individually or common vented.

SECTION 915.42

COMBINATION ~~WASTE DRAIN~~ AND VENT SYSTEM

91512.1 Type of fixtures. A combination ~~waste drain~~ and vent system shall not serve fixtures other than floor drains, sinks, lavatories and drinking fountains. Combination ~~waste drain~~ and vent systems shall not receive the discharge from a commercial food waste ~~disposer grinder~~ or clinical sink.

91512.2 Installation. The only vertical pipe of a combination ~~waste drain~~ and vent system shall be the connection between the fixture drain of a sink, floor drain, lavatory or drinking fountain[A33], and the horizontal combination ~~waste drain~~ vent pipe. The ~~maximum~~ vertical distance shall ~~be not exceed~~ 8 feet (2438 mm) and the minimum pipe diameter shall be 3 inches. The 3-inch pipe shall rise vertically as high as possible above the fixture drain connection for island sinks and terminate with a cap or an approved air admittance valve. Island sinks may be installed using a combination drain and vent system[A34].

91512.2.1 Slope. The horizontal combination ~~waste drain~~ and vent pipe shall ~~not exceed have a maximum slope of one-half unit vertical in 12 units horizontal (4-percent slope). The minimum slope and shall not be less than indicated be in accordance with Table 704.1 or unless approved by the state administrative authority.~~

9152.2.1.2 Restricted waste. No drainage piping conveying soil or waste from water closets or urinals shall be connected to any combination ~~waste drain~~ and vent system: nor shall such waste pass through any part of the combination ~~waste drain~~ and vent system[A35].

9152.2.32 Connection. The combination ~~waste drain~~ and vent system shall be provided with a dry vent connected at any point within the combination ~~waste drain~~ system and shall be sized in accordance with Table 90616.1. in the system shall connect to a horizontal drain that serves vented fixtures located on the same floor. Combination waste and vent systems connecting to building drains receiving only the discharge from one or more stacks shall be provided with a dry vent. The vent connection to the combination waste and vent pipe shall extend vertically to a point not less than 6 inches(152 mm) above the flood level rim of the highest fixture being vented before offsetting horizontally.

915.42.2.43 Size of the combination ~~waste drain~~ and vent piping. Piping shall be increased two (2) pipe sizes greater than the fixture trap served, beginning at the trap and including all branches and the main ~~drain~~[A36].

SECTION 916.43

ISLAND FIXTURE VENTING

91613.1 Limitation. Island fixture venting shall not be permitted for fixtures other than sinks and lavatories. Residential kitchen sinks with a dishwasher waste connection, a food waste ~~grinder disposer~~, or both, in combination with the kitchen sink waste, shall be permitted to be vented in accordance with this section.

91613.2 Vent connection. The island fixture vent shall connect to the fixture drain as required for an individual or common vent. The vent shall rise vertically to above the drainage outlet of the fixture being vented before offsetting horizontally or vertically downward. The vent or branch vent for multiple island fixture vents shall extend to a point not less than minimum of 6 inches (152 mm) above the highest island fixture being vented before connecting to the outside vent terminal.

91613.3 Vent installation below the fixture flood level rim. The vent located below the flood level rim of the fixture being vented shall be installed as required for drainage piping in accordance with Chapter 7, except for sizing. The vent shall be sized in accordance with Section 90616.2. The lowest point of the island fixture vent shall connect full size to the drainage system. The connection shall be to a vertical drainpipe or to the top half of a horizontal drain pipe. Cleanouts shall be provided in the island fixture vent to permit rodding of vent piping located below the flood level rim of the fixtures. Rodding in both directions shall be permitted through a cleanout.

SECTION 917

AIR ADMITTANCE VALVES

917.1 General. Vent systems utilizing air admittance valves shall comply with this section. ~~Individual and branch-type air admittance valves shall conform to ASSE 1051~~ Stack-type air admittance valves shall conform to ASSE 1050. Individual and branch-type air admittance valves shall conform to ASSE 1051.

917.2 Installation. The valves shall be installed in accordance with the requirements of this section and the manufacturer's installation instructions. Air admittance valves shall be installed after the DWV testing required by Section 312.2 or 312.3 has been performed.

917.3 Where permitted. Individual, branch and circuit vents shall be permitted to terminate with a connection to an individual or branch-type air admittance valve in accordance with Section 917.3.1. Stack vents and vent stacks shall be permitted to terminate to stack-type air admittance valves in accordance with Section 917.3.2. Individual and branch-type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain. The horizontal branch drain having individual and branch-type air admittance valves shall conform to Section 917.3.1 or Section 917.3.2.

917.3.1 Horizontal branches. Individual and branch-type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain. Where the horizontal branch is located more than four branch intervals from the top of the stack, the horizontal branch shall be provided with a relief vent that shall connect to a vent stack or stack vent, or extend outdoors to the open air. The relief vent shall connect to the horizontal branch drain between the stack and the most downstream fixture drain connected to the horizontal branch drain. The relief vent shall be sized in accordance with Section 906.2 and installed in accordance with Section 905. The relief vent shall be

permitted to serve as the vent for other fixtures.

917.3.1 Location of branch. ~~The horizontal branch drain shall connect to the drainage stack or building drain a maximum of four branch intervals from the top of the stack.~~

917.3.2 Relief vent. ~~Where the horizontal branch is located more than four branch intervals from the top of the stack, the horizontal branch shall be provided with a relief vent that shall connect to a vent stack, or stack vent, or extend outdoors to the open air. The relief vent shall connect to the horizontal branch drain between the stack or building drain and the most downstream fixture drain connected to the horizontal branch drain. The relief vent shall be sized in accordance with Section 916.2 and installed in accordance with Section 905. The relief vent shall be permitted to serve as the vent for other fixtures.~~

917.3.23 Stack. ~~Stack-type air admittance valves shall be prohibited from not serving e as the vent terminal for vent stacks or stack vents that serve drainage stacks having more than exceeding six branch intervals.~~

917.4 Location. Individual and branch-type air admittance valve shall be located a minimum of 4 inches (102 mm) above the horizontal branch drain or ~~above the~~ fixture drain being vented. Stack-type air admittance valves shall be located not less than 6 inches (152 mm) above the flood level rim of the highest fixture being vented. The air admittance valve shall be located within the maximum developed length permitted for the vent. The air admittance valve shall be installed not less than a minimum of 6 inches (152 mm) above insulation materials.

917.5 Access and ventilation. Access shall be provided to all air admittance valves. ~~Such The valves~~ shall be installed in locations located within a ventilated space that allows air to enter the valve.

917.6 Size. The air admittance valve shall be rated in accordance with the standard for the size of the vent to which the valve is connected.

917.7 Vent required. Within each plumbing system, a minimum of one stack vent or vent stack shall extend outdoors to the open air.

917.8 Prohibited installations. Air admittance valves shall not be installed in nonneutralized special waste systems as described in Chapter 8 except where such valves are in compliance with ASSE 1049, are constructed of materials approved in accordance with Section 702.5 and are tested for chemical resistance in accordance with ASTM F 1412. Air Admittance Vvalves shall not be located in spaces utilized as supply or return air plenums. Air admittance valves shall not be used to vent sumps or tanks except where the vent system for the sump or tank has been designed by an engineer. Air admittance valves shall not be installed on outdoor vent terminals for the sole purpose of reducing clearances to gravity air intakes or mechanical air intakes.

CHAPTER 10

TRAPS, INTERCEPTORS AND SEPARATORS

User note:

About this chapter: Chapter 10 regulates the design of fixture traps, methods for preventing evaporation of trap seals in traps and the required locations for interceptors and separators. The trap seal of a trap is an essential feature of a drainage system to prevent odors from the drainage piping from entering the building. The discharge of various processes, such as cooking and laundry, creates the need for equipment to retain detrimental greases and solids from entering the drainage systems.

SECTION 1001 GENERAL

1001.1 Scope. This chapter shall govern the material and installation of traps, interceptors and separators.

SECTION 1002 TRAP REQUIREMENTS

1002.1 Fixture traps. Each plumbing fixture shall be separately trapped by a water-seal trap, except as otherwise permitted by this code. The trap shall be placed as close as possible to the fixture outlet. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches (610 mm) and the horizontal distance shall not exceed 30 inches (762 mm) measured from the centerline of the fixture outlet to the centerline of the inlet of the trap. The height distance of a clothes washer standpipe above a trap shall conform to Section 802.3.34. A fixture shall not be double trapped.

Exceptions:

This section shall not apply to fixtures with integral traps.

A combination plumbing fixture is permitted to be installed on one trap provided that one compartment is not more than 6 inches (152 mm) deeper than the other compartment and the waste outlets are not more than 30 inches (762 mm) apart.

A grease interceptor trap intended to serve as a fixture trap in accordance with the manufacturer's installation instructions shall be permitted to serve as the trap for a single fixture or a combination sink of not more than three compartments where the vertical distance from the fixture outlet to the inlet of the interceptor does not exceed 30 inches (762 mm), and the developed length of the waste pipe from the most upstream fixture outlet to the inlet of the interceptor does not exceed 60 inches (1524 mm).

4. Area drains in multilevel parking structures that discharge to a building storm sewer shall not be required to be individually trapped. Where floor drains in multilevel parking structures are required to discharge to a combined building sewer system, the floor drains shall not be required to be individually trapped provided that they are connected to a main trap in accordance with Section 1103.1

1002.2 Design of traps. Fixture traps shall be self-scouring. Fixture traps shall not have interior partitions, except where

such traps are integral with the fixture or where such traps are constructed of an approved material that is resistant to corrosion and degradation. Slip joints shall be made with an approved elastomeric gasket and shall be installed only on the trap inlet, trap outlet and within the trap seal.

1002.3 Prohibited traps. The following types of traps are prohibited:

Traps that depend on moving parts to maintain the seal.

Bell traps.

Crown-vented traps.

Traps not integral with a fixture and that depend on interior partitions for the seal, except those traps constructed of an approved material that is resistant to corrosion and degradation.

"S" traps.

Drum traps.

Exception: Drum traps used as solids interceptors and drum traps serving chemical waste systems shall not be prohibited.

1002.4 Trap seals. Each fixture trap shall have a liquid seal of not less than 2 inches (51 mm) and not more than 4 inches (102 mm), or deeper for special designs relating to accessible fixtures. ~~An approved trap primer shall be installed on all floor drains and hub drains. An approved trap guard product that conforms to NSF 14, CSA B602-99 and CSA B79-94 may be used as an alternate instead of a trap primer. A trap seal primer valve shall conform to ASSE 1018 or ASSE 1044.~~

1002.4.1 Trap seal protection. Trap seals of emergency floor drain traps and trap seals subject to evaporation shall be protected by one of the methods in Sections 1002.4.1.1 through 1002.4.1.4.

1002.4.1.1 Potable water-supplied trap seal primer valve. A potable water-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal on the inlet side of the trap.

1002.4.1.2 Reclaimed or gray water-supplied trap seal primer valve. A reclaimed or gray water-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The

quality of reclaimed or gray water supplied to trap seal primer valves shall be in accordance with the requirements of the manufacturer of the trap seal primer valve. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal, on the inlet side of the trap.

1002.4.1.3 Waste water-supplied trap primer device. A waste water-supplied trap primer device shall supply water to the trap. Waste water-supplied trap primer devices shall conform to ASSE 1044. The discharge pipe from the trap seal primer device shall connect to the trap above the trap seal on the inlet side of the trap.

1002.4.1.4 Barrier-type trap seal protection device. A barrier-type trap seal protection device shall protect the floor drain trap seal from evaporation. Barrier-type floor drain trap seal protection devices shall conform to ASSE 1072. The devices shall be installed in accordance with the manufacturer's instructions.

1002.5 Size of fixture traps. Fixture trap size shall be sufficient to drain the fixture rapidly and not less than the size indicated in Table 709.1. A trap shall not be larger than the drainage pipe into which the trap discharges.

1002.6 Building traps. Building (house) traps shall be prohibited, ~~except where approved by the administrative authorities. Building house traps shall be provided with a cleanout and relief vent or fresh air intake shall not be less than one half the diameter of the drain to which the relief vent or air intake connects. Such relief vent or fresh air intake shall be carried above grade and shall be terminated in a screened outlet located outside the building~~

1002.7 Trap setting and protection. Traps shall be set level with respect to the trap seal and, where necessary, shall be protected from freezing.

1002.8 Recess for trap connection. A recess provided for connection of the underground trap, such as one serving a bathtub in slab-type construction, shall have sides and a bottom of corrosion-resistant, insect- and verminproof construction.

1002.9 Acid-resisting traps. Where a vitrified clay or other brittleware, acid-resisting trap is installed underground, such trap shall be embedded in concrete extending 6 inches (152 mm) beyond the bottom and sides of the trap.

1002.10 Plumbing in mental health centers. In mental health centers, pipes and traps shall not be exposed.

SECTION 1003 INTERCEPTORS AND SEPARATORS

1003.1 Where required. Interceptors and separators shall be provided to prevent the discharge of oil, grease, sand and other substances harmful or hazardous to the building drainage sys-

tem, the public sewer, or sewage treatment plant or processes.

1003.2 Approval. The size, type and location of each interceptor and of each separator shall be designed and installed in accordance with the manufacturer's instructions and the requirements of this section based on the anticipated conditions of use. Wastes that do not require treatment or separation shall not be discharged into any interceptor or separator.

1003.3 Grease traps and grease interceptors. Grease traps and grease interceptors shall comply with the requirements of Sections 1003.3.1 through 1003.3.4.2.

1003.3.1 Grease traps and grease interceptors and automatic grease removal devices required. A grease trap or grease interceptor or automatic grease removal device shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias, ~~or restaurants and clubs. Fixtures and equipment shall include pot sinks, prerinse sinks, soup kettles or similar devices; wok stations; floor drains or sinks into which kettles are drained; automatic hood wash units and dishwashers without prerinse sinks. Grease interceptors and automatic grease removal devices shall receive waste only from fixtures and equipment that allow fats, oils or grease to be discharged. Where lack of space or other constraints prevent the installation or replacement of a grease interceptor, one or more grease interceptors shall be permitted to be installed on or above the floor and upstream of an existing grease interceptor~~

1003.3.2 Food waste disposers restriction. A food waste disposer shall not discharge to a grease interceptor unless approved by the state administrative authority.

~~**1003.3.2 Food waste grinders.** Where food waste grinders connect to grease traps, a solids interceptor shall separate the discharge before connecting to the grease trap. Solids interceptors and grease interceptors shall be sized and rated for the discharge of the food waste grinder.~~

1003.3.3 Additives to grease interceptors. Dispensing systems that dispense interceptor performance additives to grease interceptors shall not be installed except where such systems dispense microbes for the enhancement of aerobic bioremediation of grease and other organic material, or for inhibiting growth of pathogenic organisms by anaerobic methods. Such microbial dispensing systems shall be installed only where the grease interceptor manufacturer's instructions allow such systems and the systems conform to ASME A112.14.6. Systems that discharge emulsifiers, chemicals or enzymes to grease interceptors shall be prohibited.

1003.3.4 Grease trap and grease interceptor and automatic grease removal devices not required. A grease trap or a grease interceptor or an automatic grease

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removal device shall not be required for individual dwelling units or any private living quarters.

1003.3.5 Hydromechanical grease interceptors, fats, oils and greases disposal systems and automatic grease removal devices. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be sized in accordance with ASME A112.14.3, ASME 112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be designed and tested in accordance with ASME A112.14.3, ASME 112.14.4, CSA B481.1, PDI G101 or PDI G102. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be installed in accordance with the manufacturer's instructions. Where manufacturer's instructions are not provided, hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be installed in compliance with ASME A112.14.3, ASME 112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101.

~~**1003.3.4 Grease traps and grease interceptors.** Grease traps and grease interceptors shall conform to PDI G101, ASME A112.14.3 or ASME A112.14.4 and shall be installed in accordance with the manufacturer's instructions.~~

1003.3.5.1 Grease trap-interceptor capacity. Grease interceptor traps shall have the grease retention capacity indicated in Table 1003.3.4.1 for the flow-through rates indicated.

1003.3.5.2 Rate of flow controls. Grease traps shall be equipped with devices to control the rate of water flow so that the water flow does not exceed the rated flow. The flow-control device shall be vented and terminate not less than 6 inches (152 mm) above the flood rim level or be installed in accordance with the manufacturer's instructions.

1003.3.6 Automatic grease removal devices. Where automatic grease removal devices are installed, such devices shall be located downstream of each fixture or multiple fixtures in accordance with the manufacturer's instructions. The automatic grease removal device shall be sized to pretreat the measured or calculated flows for all connected fixtures or equipment. Ready access shall be provided for inspection and maintenance.

1003.3.7 Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems. The required capacity of gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be determined by multiplying the peak drain flow into the interceptor in gallons per minute by a retention time of 30 minutes. Gravity grease interceptors shall be designed and tested in accordance with IAPMO/ANSI Z1001. Gravity grease interceptors with fats, oils, and greases disposal systems shall be

designed and tested in accordance with ASME A112.14.6 and IAPMO/ANSI Z1001. Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in accordance with manufacturer's instructions. Where manufacturer's instructions are not provided, gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in compliance with ASME A112.14.6 and IAPMO/ANSI Z1001.

1003.3.8 Direct connection. The discharge piping from a grease interceptor shall be directly connected to the sanitary drainage system.

TABLE 1003.3.4.1
CAPACITY OF GREASE ~~INTERCEPTORS~~ **a TRAPS**

TOTAL FLOW-THROUGH RATING (gpm)	GREASE RETENTION CAPACITY (pounds)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100
<u>75</u>	<u>150</u>
<u>100</u>	<u>200</u>

For SI: 1 gallon per minute = 3.785 L/m, 1 pound = 0.454 kg.

a. For total flow-through ratings greater than 100 (gpm), double the flow-through rating to determine the grease retention capacity (pounds).

1003.4 Oil separators required. ~~At repair garages, W where floor or trench drains are provided, oil may discharge into elevator pits and at repair garages, car-washing facilities with engine or undercarriage cleaning capability and at factories where oily and flammable liquid wastes are produced and hydraulic elevator pits,~~ separators shall be installed into which all oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal.

Exception: An oil separator is not required in hydraulic elevator pits where an approved alarm system is installed. Such alarm systems shall not terminate the

operation of pumps utilized to maintain emergency operation of the elevator by fire fighters.

1003.4.1 Separation of liquids. A mixture of treated or untreated light and heavy liquids with various specific gravities shall be separated in an approved receptacle.

1003.4.2 Oil separator design. Oil separators shall be designed in accordance with Sections 1003.4.2.1 and 1003.4.2.2.

1003.4.2.1 General design requirements. Oil separators shall have a depth of not less than 2 feet (610 mm) below the invert of the discharge drain. The outlet opening of the separator shall have not less than an 18-inch (457 mm) water seal.

1003.4.2.2 Garages and service stations. Where automobiles are serviced, greased, repaired or washed or where gasoline is dispensed, oil separators shall have a minimum capacity of 6 cubic feet (0.168 m³) for the first 100 square feet (9.3 m²) of area to be drained, plus 1 cubic foot (0.28 m³) for each additional 100 square feet (9.3 m²) of area to be drained into the separator. Parking garages in which servicing, repairing or washing is not conducted, and in which gasoline is not dispensed, shall not require a separator. Areas of commercial garages utilized only for storage of automobiles are not required to be drained through a separator.

1003.5 Sand interceptors in commercial establishments. Sand and similar interceptors for heavy solids shall be designed and located so as to be provided with ready access for cleaning, and shall have a water seal of not less than 6 inches (152mm).

1003.6—~~Laundries~~ Clothes washer discharge interceptor. ~~Commercial laundries shall be equipped with Clothes washers shall discharge through~~ an interceptor with a wire basket or similar device, removable for cleaning, that prevents passage into the drainage system of solids ~~0.5 1/2~~ inch (12.7 mm) or larger in size, string, rags, buttons or other materials detrimental to the public sewage system.

Exceptions:

Clothes washers in individual dwelling units shall not be required to discharge through an interceptor.

Residential type clothes washers designed for use in individual dwelling units and installed in a location other than an individual dwelling unit shall not be required to discharge through an interceptor.

1003.7 Bottling establishments. Bottling plants shall discharge process wastes into an interceptor that will provide for the separation of broken glass or other solids before discharging waste into the drainage system.

1003.8 Slaughterhouses. Slaughtering room and dressing room drains shall be equipped with approved separators. The separator shall prevent the discharge into the drainage system of feathers, entrails and other materials that cause clogging.

1003.9 Venting of interceptors and separators. Interceptors and separators shall be designed so as not to become air bound. ~~where tight covers are utilized. Interceptors and separators shall be vented in accordance with one of the methods in Chapter 9, shall be vented where subject to a loss of trap seal.~~

1003.10 Access and maintenance of interceptors and separators. Access shall be provided to each interceptor and separator for service and maintenance. Interceptors and separators shall be maintained by periodic removal of accumulated grease, scum, oil, or other floating substances and solids deposited in the interceptor or separator.

SECTION 1004

MATERIALS, JOINTS AND CONNECTIONS

1004.1 General. The materials and methods utilized for the construction and installation of traps, interceptors and separators shall comply with this chapter and the applicable provisions of Chapters 4 and 7. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow of the piping.

CHAPTER 11

STORM DRAINAGE

User note:

About this chapter: Rainfall onto buildings must be removed and directed to a location that can accommodate storm water. Chapter 11 specifies the design rainfall event for the geographic area and provides sizing methods for piping and gutter systems to convey the storm water away from the building. Included in this chapter are regulations for piping materials and subsoil drainage systems.

SECTION 1101 GENERAL

1101.1 Scope. The provisions of this chapter shall govern the materials, design, construction and installation of storm drainage.

1101.2 ~~Where required~~ Disposal. ~~All roofs.~~ Rainwater from roofs and storm water from paved areas, yards, courts and courtyards shall drain into a separate storm sewer system, or a combined sewer system, or to an approved place of disposal. For one and two-family dwellings, and where approved, storm water is permitted to discharge onto flat areas, such as streets or lawns, provided that the storm water flows away from the building.

1101.3 Prohibited drainage. Storm water shall not be drained into sewers intended for sewage only.

1101.4 Tests. The conductors and the building storm drain shall be tested in accordance with Section 312.

1101.5 Change in size. The size of a drainage pipe shall not be reduced in the direction of flow.

1101.6 Fittings and connections. All connections and changes in direction of the storm drainage system shall be made with approved drainage-type fittings in accordance with Table 706.3. The fittings shall not obstruct or retard flow in the system.

1101.7 Roof design. Roofs shall be designed for the maximum possible depth of water that will pond thereon as determined by the relative levels of roof deck and overflow weirs, scuppers, edges or serviceable drains in combination with the deflected structural elements. In determining the maximum possible depth of water, all primary roof drainage means shall be assumed to be blocked. The maximum possible depth of water on the roof shall include the height of the water required above the inlet of the secondary roof drainage means to achieve the required flow rate of the secondary drainage means to accommodate the design rainfall rate as required by Section 1106.

1101.8 Cleanouts required. Cleanouts shall be installed in the storm drainage system and shall comply with the provisions of this code for sanitary drainage pipe cleanouts.

Exception: Subsurface drainage system.

1101.9 Backwater valves. ~~Backwater valves installed in a storm drainage system shall conform to Section 715. Storm drainage systems shall be provided with backwater valves as required for sanitary drainage systems in accordance with Section 715.~~

SECTION 1102 MATERIALS

1102.1 General. The materials and methods utilized for the construction and installation of storm drainage systems shall comply with this section and the applicable provisions of Chapter 7.

1102.2 Inside storm drainage conductors. Inside storm drainage conductors installed above ground shall conform to one of the standards listed in Table 702.1.

1102.3 Underground building storm drain pipe. Underground building storm drain pipe shall conform to one of the standards listed in Table 702.2.

1102.4 Building storm sewer pipe. Building storm sewer pipe shall conform to one of the standards listed in Table 1102.4.

1102.5 Subsoil drain pipe. Subsoil drains shall be open-jointed, horizontally split or perforated pipe conforming to one of the standards listed in Table 1102.5.

1102.6 Roof drains. Roof drains shall conform to ASME A112.21.2M or ASME A112.3.1

1102.7 Fittings. Pipe fittings shall be approved for installation with the piping material installed, and shall conform to the respective pipe standards or one of the standards listed in Table 1102.7. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type.

SECTION 1103 TRAPS

1103.1 Main trap. ~~Deleted.~~ Leaders and storm drains connected to a combined sewer shall be trapped.

Individual storm water traps shall be installed on the storm water drain *branch* serving each conductor, or a single trap shall be installed in the main *storm drain* just before its connection with the combined *building sewer* or the *public sewer*. Leaders and storm drains connected to a building storm sewer shall not be required to be trapped.

**TABLE 1102.4
BUILDING STORM SEWER PIPE**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe <u>in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall.</u>	ASTM D 2661; ASTM D 2751 ; ASTM F 628; ASTM F1488 ; CSA B181.1; CSA B182.1
Asbestos-cement pipe	ASTM C 428
Cast-iron pipe	ASTM A 74; ASTM A 888; CISPI 301
Concrete pipe	ASTM C 14; ASTM C 76; CSA A257.1M; CSA A257.2M
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 306
<u>Polyethylene (PE) plastic pipe</u>	<u>ASTM F667; ASTM F2306/F2306M; ASTM F2648/F2648M</u>
<u>Polypropylene (PP) pipe</u>	<u>ASTM F2884; CSA B182.13</u>
Polyvinyl chloride (PVC) plastic pipe (Type DWV, SDR26, SDR35, SDR41, PS50 or PS100) <u>in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall.</u>	ASTM D 2665; ASTM D 3034; ASTM F 891; ASTM F1488 ; CSA B182.4; CSA B184.2; CSA B182.2
Vitrified clay pipe	ASTM C 4; ASTM C 700
Stainless steel drainage systems, Type 316L	ASME A112.3.1

1103.2 Material. Storm water traps shall be of the same material as the piping system to which they are attached.

1103.3 Size. Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

1103.4 Cleanout. An accessible cleanout shall be installed on the building side of the trap and shall be provided with access.

**TABLE 1102.5
SUBSOIL DRAIN PIPE**

MATERIAL	STANDARD
Asbestos-cement pipe	ASTM C 508
Cast-iron pipe	ASTM A 74; ASTM A 888; CISPI 301
Polyethylene (PE) plastic pipe	ASTM F 405; ASTM F667 ; CSA B182.1; CSA B182.6; CSA B182.8
Polyvinyl chloride (PVC) Plastic pipe (type sewer pipe, SDR35 , PS25, PS50 or PS100,	ASTM D 2729; ASTM D 3034 ; ASTM F 891; CSA B182.2; CSA B182.4
Stainless steel drainage systems, Type 316L	ASME A112.3.1
Vitrified clay pipe	ASTM C 4; ASTM C 700

**TABLE 1102.7
PIPE FITTINGS**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic	ASTM D 2661; ASTM D 3311; CSA B181.1
Cast-iron	ASME B16.4; ASME B16.12; ASTM A 888; CISPI 301; ASTM A 74
Coextruded composite ABS sewer and drain DR-PS in PS35, PS50, PS100, PS140, PS200	ASTM D 2751
Coextruded composite ABS DWV Schedule 40 IPS pipe (solid or cellular core)	ASTM D 2661; ASTM D 3311; ASTM F 628
Coextruded composite PVC DWV Schedule 40 IPS-DR, PS140, PS200 (solid or cellular core)	ASTM D 2665; ASTM D 3311; ASTM F 891
Coextruded composite PVC sewer and drain DR-PS in PS35, PS50, PS100, PS140, PS200	ASTM D 3034
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Gray iron and ductile iron	AWWA C110/ <u>A21.10</u>
Malleable iron	ASME B16.3
Plastic, general	ASTM F 409
<u>Polyethylene (PE) plastic pipe</u>	<u>ASTM F 2306/F 2306M</u>
Polyvinyl chloride (PVC) plastic	ASTM D 2665; ASTM D 3311; ASTM F 1866
Steel	ASME B16.9; ASME B16.11; ASME B16.28
Stainless steel drainage Systems, Type 316L	ASME A112.3.2

STORM DRAINAGE

SECTION 1104 CONDUCTORS AND CONNECTIONS

1104.1 Prohibited use. Conductor pipes shall not be used as soil, waste or vent pipes, and soil, waste or vent pipes shall not be used as conductors.

~~**1104.2 Combining storm with sanitary drainage.** Deleted.~~

1104.23 Floor drains. Floor drains shall not be connected to a storm drain.

SECTION 1105 ROOF DRAINS

~~**1105.1 Strainers General.** Roof drains shall have strainers extending not less than 4 inches (102 mm) above the surface of the roof immediately adjacent to the roof drain. Strainers shall have an available inlet area, above roof level, of not less than one and one-half times the area of the conductor or leader to which the drain is connected, be installed in accordance with the manufacturer's instructions. The inside opening for the roof drain shall not be obstructed by the roofing membrane material.~~

1105.2 Roof drain flow rate. The published roof drain flow rate, based on the head of water above the roof drain, shall be used to size the storm drainage system in accordance with Section 1106. The flow rate used for sizing the storm drainage piping shall be based on the maximum anticipated ponding at the roof drain.

~~**1105.2 Flat decks.** Roof drain strainers for use on sun decks, parking decks and similar areas that are normally serviced and maintained shall comply with Section 1105.1 or shall be of the flat surface type, installed level with the deck with an available inlet area not less than two times the area of the conductor or leader to which the drain is connected.~~

1105.3 Roof drain flashings. The connection between roofs and roof drains which pass through the roof and into the interior of the building shall be made water tight by the use of approved flashing material.

SECTION 1106 SIZE OF CONDUCTORS, LEADERS AND STORM DRAINS

1106.1 General. The size of the vertical conductors and leaders, building storm drains, building storm sewers, and any horizontal branches of such drains or sewers shall be based on the 100-year hourly rainfall rate indicated in Figure 1106.1 or on other rainfall rates determined from approved local weather data.

1106.2 Size of storm drain piping. Vertical and horizontal storm drain piping shall be sized based on the flow rate through the roof drain. The flow rate in storm drain piping shall not exceed that specified in Table 1106.2.

1106.3 Vertical leader sizing. Vertical leaders shall be sized based on the flow rate from horizontal gutters or the maximum flow rate through roof drains. The flow rate through

vertical leaders shall not exceed that specified in Table 1106.3.

~~**1106.2 Vertical conductors and leaders.** Vertical conductors and leaders shall be sized for the maximum projected roof area, in accordance with Table 1106.2.~~

1106.3 Building storm drains and sewers. The size of the building storm drain, building storm sewer and their horizontal branches having a slope of one half unit or less vertical in 12 units horizontal (4 percent slope) shall be based on the maximum projected roof area in accordance with Table 1106.3. The minimum slope of horizontal branches shall be one eighth unit vertical in 12 units horizontal (1 percent slope) unless otherwise approved.

1106.4 Vertical walls. In sizing roof drains and storm drainage piping, one-half of the area of any vertical wall that diverts rainwater to the roof shall be added to the projected roof area for inclusion in calculating the required size of vertical conductors, leaders and horizontal storm drainage piping.

~~**1106.5 Parapet wall scupper location.** Parapet wall roof drainage scupper and overflow scupper location Where scuppers are used for primary roof drainage or for secondary (emergency overflow) roof drainage or both, the quantity, size, location and inlet elevation of the scuppers shall be chosen to prevent the depth of ponding water on the roof from exceeding the maximum water depth that the roof was designed and shall comply with the requirements of the Arkansas Fire Prevention Code. Scupper openings shall be not less than 4 inches (102 mm) in height and have a width that is equal to or greater than the circumference of a roof drain sized for the same roof area. The flow through the primary system shall not be considered when locating and sizing secondary scuppers.~~

~~**1106.6 Size of roof gutters.** The size of semicircular gutters shall be based on the maximum projected roof area in accordance with Table 1106.6.~~

1106.6 Size of roof gutters. Horizontal gutters shall be sized based on the flow rate from the roof surface. The flow rate in horizontal gutters shall not exceed that specified in Table 1106.6.

SECTION 1107 SIPHONIC ROOF DRAINAGE SYSTEMS

1107.1 General. Siphonic roof drains and drainage systems shall be designed in accordance with ASME A112.6.9 and ASPE 45.

STORM DRAINAGE



FIGURE 1106.1
100-YEAR, 1-HOUR RAINFALL (INCHES)
EASTERN UNITED STATES

For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

STORM DRAINAGE

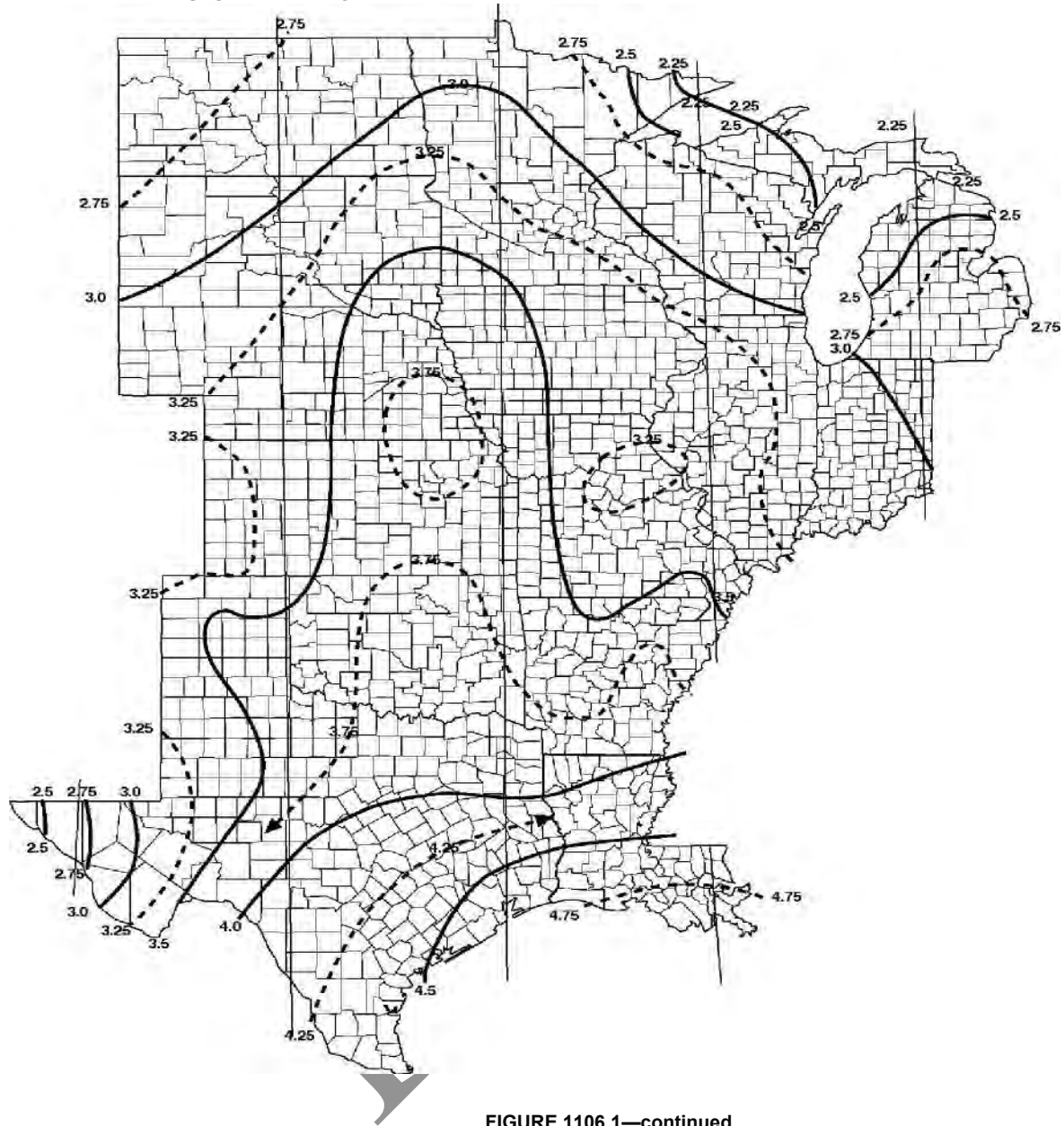


FIGURE 1106.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES)
CENTRAL UNITED STATES
 For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

STORM DRAINAGE

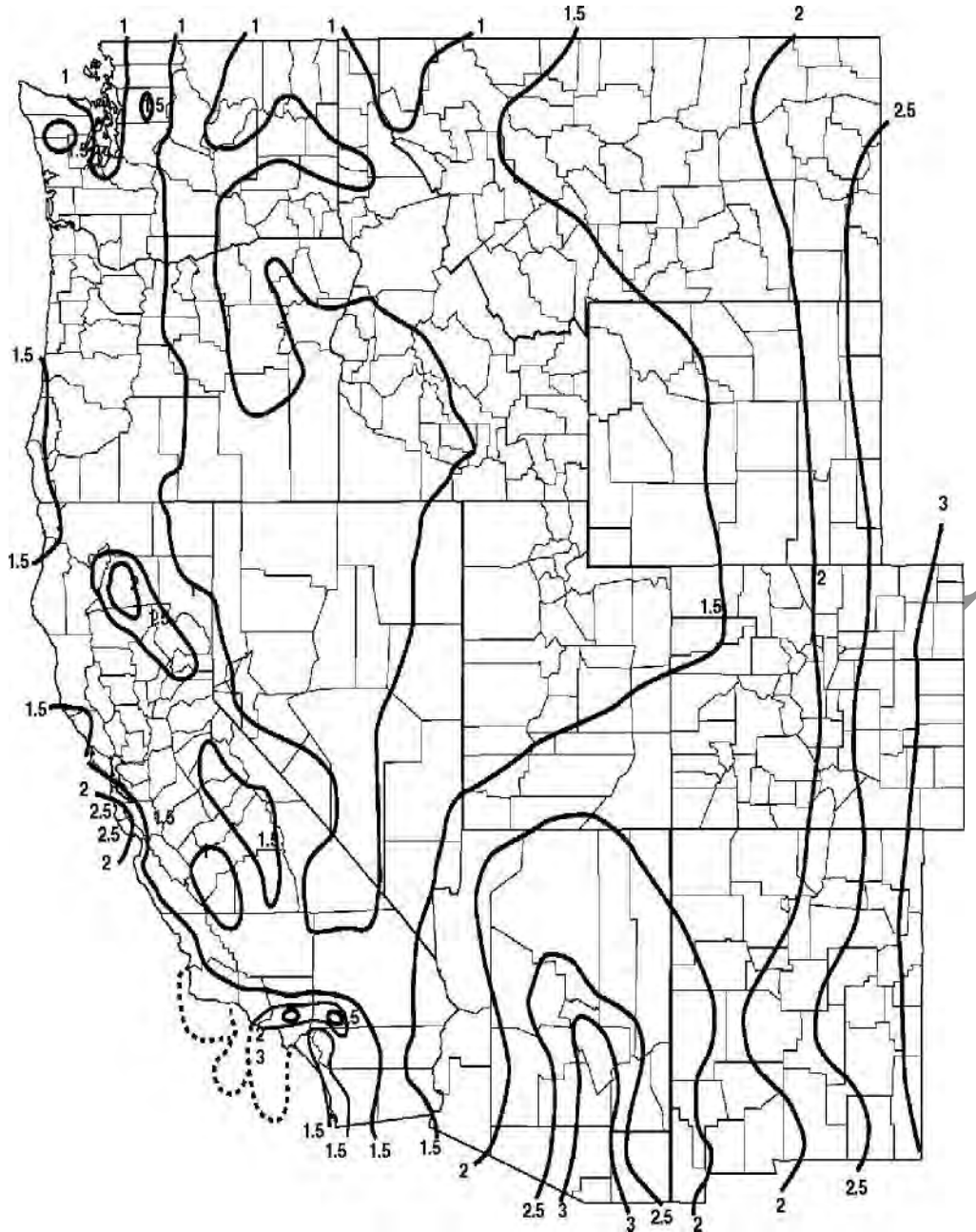
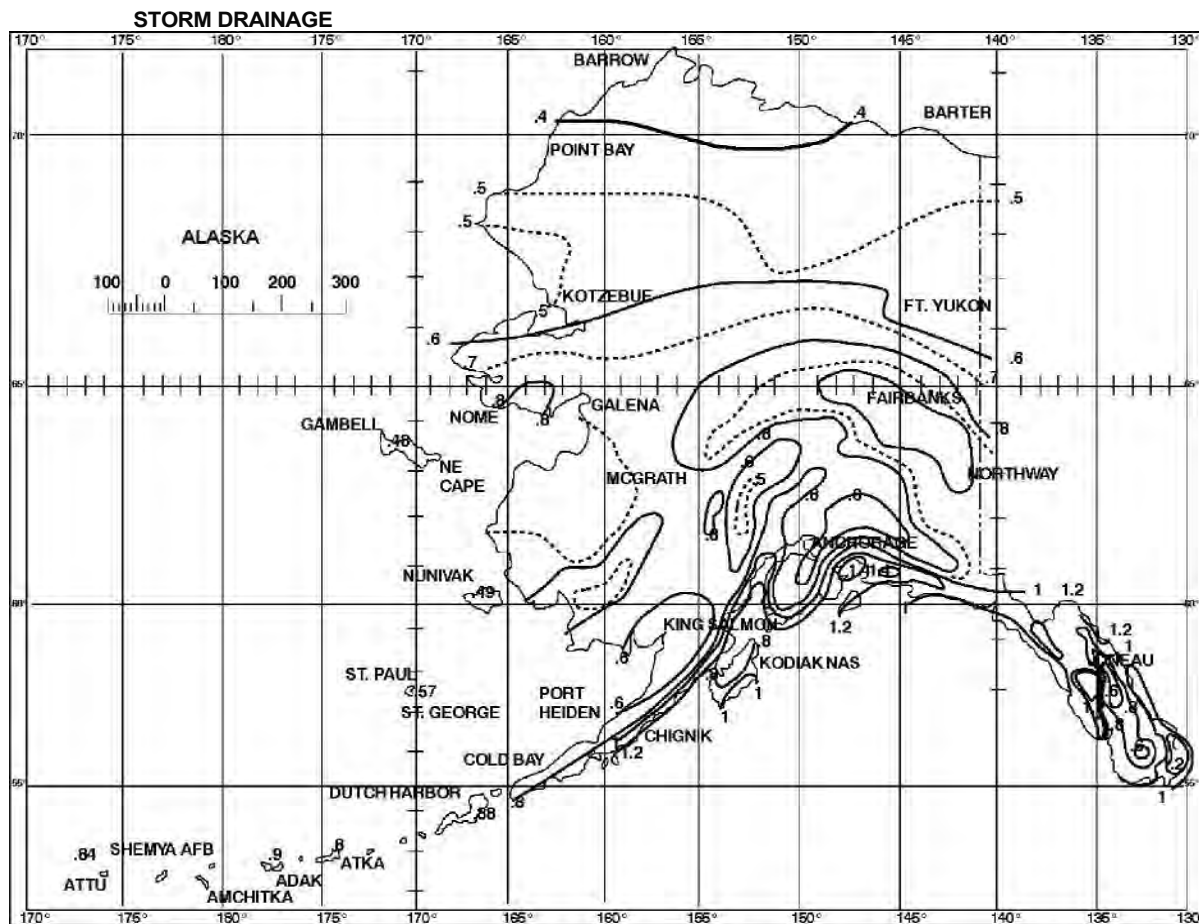


FIGURE 1106.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES)
WESTERN UNITED STATES

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C



**FIGURE 1106.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES)
ALASKA**

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C

STORM DRAINAGE

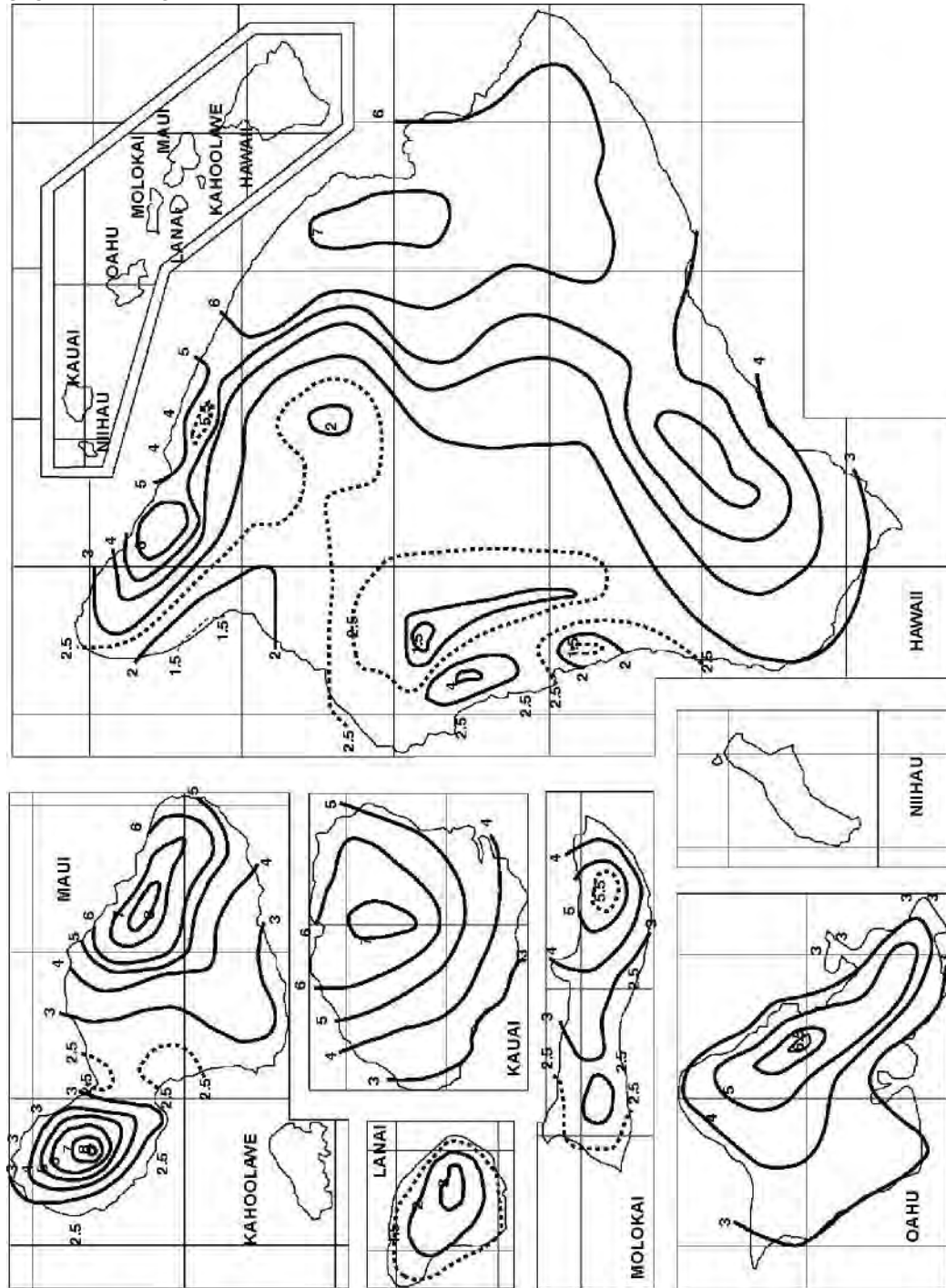


FIGURE 1106.1—continued
100-YEAR, 1-HOUR RAINFALL (INCHES)
HAWAII

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

STORM DRAINAGE

SECTION 1108.7

SECONDARY (EMERGENCY) ROOF DRAINS

1108.7.1 Secondary (emergency overflow) drains or scuppers—drainage required. Where roof drains are required, secondary (emergency) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. Where primary and secondary roof drains are manufactured as a single assembly, the inlet and outlet for each drain shall be independent.

1108.7.2 Separate systems required. Secondary roof drain systems shall have the end point of discharge separate from the primary system. Discharge shall be above grade, in a location which would normally be observed by the building occupants or maintenance personnel.

1108.7.3 Sizing of secondary drains. Secondary (emergency) roof drain systems shall be sized in accordance with Section 1106 based on the rainfall rate for which the primary system is sized in Tables 1106.2, 1106.3 and 1106.6. Scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1101.7. Scuppers shall not have an opening dimension of less than 4 inches (102 mm). The flow through the primary system shall not be considered when sizing the secondary roof drain system.

SECTION 1109.8

COMBINED SANITARY AND STORM SYSTEM

1108.1 Size of combined drains and sewers. ~~The size of a combination sanitary and storm drain or sewer shall be computed in accordance with the method in Section 1106.3. The fixture units shall be converted into an equivalent projected roof or paved area. Where the total fixture load on the combined drain is less than or equal to 256 fixture units, the equivalent drainage area in horizontal projection shall be taken as 4,000 square feet (372 m²). Where the total fixture load exceeds 256 fixture units, each additional fixture unit shall be considered the equivalent of 15.6 square feet (1.5 m²) of drainage area. These values are based on a rainfall rate of 1 inch (25 mm) per hour.~~

1109.1 General. Where the public sewer is a combined system for both sanitary and storm water, the storm sewer shall be connected independently to the public sewer.

TABLE 1106.2
SIZE OF VERTICAL CONDUCTORS AND LEADERS

DIAMETER OF OF LEADER (inches)*	HORIZONTALLY PROJECTED ROOF AREA (square feet)											
	Rainfall rate (inches per hour)											
	4	2	3	4	5	6	7	8	9	10	11	12
2	2,880	1,440	960	720	575	480	410	360	320	290	260	240
3	8,800	4,400	2,930	2,200	1,760	1,470	1,260	1,100	980	880	800	730
4	18,400	9,200	6,130	4,600	3,680	3,070	2,630	2,300	2,045	1,840	1,675	1,530
5	34,600	17,300	11,530	8,650	6,920	5,765	4,945	4,325	3,845	3,460	3,145	2,880
6	54,000	27,000	17,995	13,500	10,800	9,000	7,715	6,750	6,000	5,400	4,910	4,500
8	116,000	58,000	38,660	29,000	23,200	19,315	16,570	14,500	12,890	11,600	10,545	9,600

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929m².

a. Sizes indicated are the diameter of circular piping. This table is applicable to piping of other shapes provided the cross-sectional shape fully encloses a circle of the diameter indicated in this table.

TABLE 1106.3
SIZE OF HORIZONTAL STORM DRAINAGE PIPING

SIZE OF HORIZONTAL PIPING (inches)	HORIZONTALLY PROJECTED ROOF AREA (square feet)					
	Rainfall rate (inches per hour)					
	4	2	3	4	5	6
1/8 unit vertical in 12 units horizontal (1-percent slope)						
3	3,288	1,644	1,096	822	657	548
4	7,520	3,760	2,506	1,800	1,504	1,253
5	13,360	6,680	4,453	3,340	2,672	2,227
6	21,400	10,700	7,133	5,350	4,280	3,566
8	46,000	23,000	15,330	11,500	9,200	7,600
10	82,800	41,400	27,600	20,700	16,580	13,800
12	133,200	66,600	44,400	33,300	26,650	22,200
15	218,000	109,000	72,800	59,500	47,600	39,650
1/4 unit vertical in 12 units horizontal (2-percent slope)						
3	4,640	2,320	1,546	1,160	928	773
4	10,600	5,300	3,533	2,650	2,120	1,766
5	18,880	9,440	6,293	4,720	3,776	3,146
6	30,200	15,100	10,066	7,550	6,040	5,033
8	65,200	32,600	21,733	16,300	13,040	10,866
10	116,800	58,400	38,950	29,200	23,350	19,450
12	188,000	94,000	62,600	47,000	37,600	31,350
15	336,000	168,000	112,000	84,000	67,250	56,000
1/2 unit vertical in 12 units horizontal (4-percent slope)						
3	6,576	3,288	2,295	1,644	1,310	1,096
4	15,040	7,520	5,010	3,760	3,010	2,500
5	26,720	13,360	8,900	6,680	5,320	4,450
6	42,800	21,400	13,700	10,700	8,580	7,140
8	92,000	46,000	30,650	23,000	18,400	15,320
10	171,600	85,800	55,200	41,400	33,150	27,600
12	266,400	133,200	88,800	66,600	53,200	44,400
15	476,000	238,000	158,800	119,000	95,300	79,250

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929m².

STORM DRAINAGE

TABLE 1106.2
STORM DRAIN PIPE SIZING

PIPE SIZE (inches)	CAPACITY (gpm)				
	VERTICAL DRAIN	SLOPE OF HORIZONTAL DRAIN			
		1/16 inch per foot	1/8 inch per foot	1/4 inch per foot	1/2 inch per foot
<u>2</u>	<u>34</u>	<u>15</u>	<u>22</u>	<u>31</u>	<u>44</u>
<u>3</u>	<u>87</u>	<u>39</u>	<u>55</u>	<u>79</u>	<u>111</u>
<u>4</u>	<u>180</u>	<u>81</u>	<u>115</u>	<u>163</u>	<u>231</u>
<u>5</u>	<u>311</u>	<u>117</u>	<u>165</u>	<u>234</u>	<u>331</u>
<u>6</u>	<u>538</u>	<u>243</u>	<u>344</u>	<u>487</u>	<u>689</u>
<u>8</u>	<u>1,117</u>	<u>505</u>	<u>714</u>	<u>1,010</u>	<u>1,429</u>
<u>10</u>	<u>2,050</u>	<u>927</u>	<u>1,311</u>	<u>1,855</u>	<u>2,623</u>
<u>12</u>	<u>3,272</u>	<u>1,480</u>	<u>2,093</u>	<u>2,960</u>	<u>4,187</u>
<u>15</u>	<u>5,543</u>	<u>2,508</u>	<u>3,546</u>	<u>5,016</u>	<u>7,093</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

TABLE 1106.3
VERTICAL LEADER SIZING

SIZE OF LEADER (inches)	CAPACITY (gpm)
<u>2</u>	<u>30</u>
<u>2 × 2</u>	<u>30</u>
<u>1 1/2 × 2 1/2</u>	<u>30</u>
<u>2 1/2</u>	<u>54</u>
<u>2 1/2 × 2 1/2</u>	<u>54</u>
<u>3</u>	<u>92</u>
<u>2 × 4</u>	<u>92</u>
<u>2 1/2 × 3</u>	<u>92</u>
<u>4</u>	<u>192</u>
<u>3 × 4 1/4</u>	<u>192</u>
<u>3 1/2 × 4</u>	<u>192</u>
<u>5</u>	<u>360</u>
<u>4 × 5</u>	<u>360</u>
<u>4 1/2 × 4 1/2</u>	<u>360</u>
<u>6</u>	<u>563</u>
<u>5 × 6</u>	<u>563</u>
<u>5 1/2 × 5 1/2</u>	<u>563</u>
<u>8</u>	<u>1208</u>
<u>6 × 8</u>	<u>1208</u>

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

TABLE 1106.6
SIZE OF SEMICIRCULAR ROOF GUTTERS

DIAMETER OF GUTTERS (inches)	HORIZONTALLY PROJECTED ROOF AREA (square feet)					
	Rainfall rate (inches per hour)					
	1	2	3	4	5	6
1/16 unit vertical in 12 units horizontal (0.5 percent slope)						
3	680	340	226	170	136	113
4	1,440	720	480	360	288	240
5	2,500	1,250	834	625	500	416
6	3,840	1,920	1,280	960	768	640
7	5,520	2,760	1,840	1,380	1,100	918
8	7,960	3,980	2,655	1,990	1,590	1,325
10	14,400	7,200	4,800	3,600	2,880	2,400
1/8 unit vertical 12 units horizontal (1 percent slope)						
3	960	480	320	240	192	160
4	2,040	1,020	681	510	408	340
5	3,520	1,760	1,172	880	704	587
6	5,440	2,720	1,815	1,360	1,085	905
7	7,800	3,900	2,600	1,950	1,560	1,300
8	11,200	5,600	3,740	2,800	2,240	1,870
10	20,400	10,200	6,800	5,100	4,080	3,400
1/4 unit vertical in 12 units horizontal (2 percent slope)						
3	1,360	680	454	340	272	226
4	2,880	1,440	960	720	576	480
5	5,000	2,500	1,668	1,250	1,000	834
6	7,680	3,840	2,560	1,920	1,536	1,280
7	11,040	5,520	3,860	2,760	2,205	1,840
8	15,920	7,960	5,310	3,980	3,180	2,655
10	28,800	14,400	9,600	7,200	5,750	4,800
1/2 unit vertical in 12 units horizontal (4 percent)						
3	1,920	960	640	480	384	320
4	4,080	2,040	1,360	1,020	816	680
5	7,050	3,520	2,360	1,770	1,415	1,180
6	11,080	5,540	3,695	2,770	2,220	1,850
7	15,600	7,800	5,200	3,900	3,120	2,600
8	22,400	11,200	7,460	5,600	4,480	3,730
10	40,000	20,000	13,330	10,000	8,000	6,660

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929m².

STORM DRAINAGE

TABLE 1106.6
HORIZONTAL GUTTER SIZING

<u>GUTTER DIMENSIONS^a</u> <u>(inches)</u>	<u>SLOPE</u> <u>(inch per foot)</u>	<u>CAPACITY</u> <u>(gpm)</u>
<u>1½ × 2½</u>	<u>¼</u>	<u>26</u>
<u>1½ × 2½</u>	<u>½</u>	<u>40</u>
<u>4</u>	<u>⅛</u>	<u>39</u>
<u>2¼ × 3</u>	<u>¼</u>	<u>55</u>
<u>2¼ × 3</u>	<u>½</u>	<u>87</u>
<u>5</u>	<u>⅛</u>	<u>74</u>
<u>4 × 2½</u>	<u>¼</u>	<u>106</u>
<u>3 × 3½</u>	<u>½</u>	<u>156</u>
<u>6</u>	<u>⅛</u>	<u>110</u>
<u>3 × 5</u>	<u>¼</u>	<u>157</u>
<u>3 × 5</u>	<u>½</u>	<u>225</u>
<u>8</u>	<u>⅛</u>	<u>172</u>
<u>8</u>	<u>⅛</u>	<u>247</u>
<u>4½ × 6</u>	<u>¼</u>	<u>348</u>
<u>4½ × 6</u>	<u>½</u>	<u>494</u>
<u>10</u>	<u>⅛</u>	<u>331</u>
<u>10</u>	<u>⅛</u>	<u>472</u>
<u>5 × 8</u>	<u>¼</u>	<u>651</u>
<u>4 × 10</u>	<u>½</u>	<u>1055</u>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m, 1 inch per foot = 83.3 mm/m. a. Dimensions are width by depth for rectangular shapes. Single dimensions are diameters of a semicircle.

SECTION 1109 VALUES FOR CONTINUOUS FLOW

~~1109.1 Equivalent roof area.~~ Where there is a continuous or semicontinuous discharge into the building storm drain or building storm sewer, such as from a pump, ejector, air conditioning plant or similar device, each gallon per minute (L/m) of such discharge shall be computed as being equivalent to 96 square feet (9 m²) of roof area, based on a rainfall rate of 1 inch (25.4 mm) per hour.

SECTION 1110 CONTROLLED FLOW ROOF DRAIN SYSTEMS

1110.1 General. The roof of a structure shall be designed for the storage of water where the storm drainage system is engineered for controlled flow. The controlled flow roof drain system shall be an engineered system in accordance with this section and the design, submittal, approval, inspection and testing requirements of Section 105.4. The controlled flow system shall be designed based on the required rainfall rate in accordance with Section 1106.1.

1110.2 Control devices. The control devices shall be installed so that the rate of discharge of water per minute shall not exceed the values for continuous flow as indicated in Section 1109.1.

1110.3 Installation. Runoff control shall be by control devices. Control devices shall be protected by strainers.

1110.4 Minimum number of roof drains. Not less than two roof drains shall be installed in roof areas 10,000 square feet (930 m²) or less and not less than four roof drains shall be installed in roofs over 10,000 square feet (930 m²) in area.

SECTION 1111 SUBSOIL DRAINS

1111.1 Subsoil drains. Subsoil drains shall be open-jointed, horizontally split or perforated pipe conforming to one of the standards listed in Table 1102.5. Such drains shall not be less than 4 inches (102 mm) in diameter. Where the building is subject to backwater, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains shall discharge to a trapped area drain, sump, dry well or approved location above ground. The subsoil sump shall not be required to have either a gas-tight cover or a vent. The sump and pumping system shall comply with Section 1113.1.

SECTION 1112 BUILDING SUBDRAINS

1112.1 Building subdrains. Building subdrains located below the public sewer level shall discharge into a sump or receiving tank, the contents of which shall be automatically lifted and discharged into the drainage system as required for

building sumps. The sump and pumping equipment shall comply with Section 1113.1.

SECTION 1113 SUMPS AND PUMPING SYSTEMS

1113.1 Pumping system. The sump pump, pit and discharge piping shall conform to Sections 1113.1.1 through 1113.1.4.

1113.1.1 Pump capacity and head. The sump pump shall be of a capacity and head appropriate to anticipated use requirements.

1113.1.2 Sump pit. The sump pit shall not be less than 18 inches (457 mm) in diameter and 24 inches (610 mm) ~~in depth~~ deep, unless otherwise approved. The pit shall be accessible and located such that all drainage flows into the pit by gravity. The sump pit shall be constructed of tile, steel, plastic, cast-iron, concrete or other approved material, with a removable cover adequate to support anticipated loads in the area of use. The pit floor shall be solid and provide permanent support for the pump.

1113.1.3 Electrical. Electrical service outlets, when required, shall meet the requirements of NFPA 70, the National Electrical Code.

1113.1.4 Piping. Discharge piping shall meet the requirements of Section 1102.2, 1102.3 or 1102.4 and shall include a gate valve and a full flow check valve. Pipe and fittings shall be the same size as, or larger than, pump discharge tapping.

Exception: In one- and two-family dwellings, only a check valve shall be required, located on the discharge piping from the pump or ejector.

CHAPTER 12 **DELETED**

CHAPTER 13

NONPOTABLE WATER SYSTEMS

User note:

About this chapter: Storm water and some liquid waste from a building can be a source of nonpotable water that can be used to reduce the volume of potable water supplied to the building. Chapter 13 provides the requirements for storage, treatment and distribution of this resource. This chapter also regulates the piping systems for reclaimed water supplied by a wastewater treatment facility.

1301.1 Scope. The provisions of Chapter 13 shall govern the materials, design, construction and installation of systems for the collection, storage, treatment and distribution of nonpotable water. The use and application of nonpotable water shall comply with laws, rules and ordinances applicable in the jurisdiction.

1301.2 Water quality. Nonpotable water for each end use application shall meet the minimum water quality requirements as established for the intended application by the laws, rules and ordinances applicable in the jurisdiction. Where nonpotable water from different sources is combined in a system, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.

1301.2.1 Residual disinfectants. Where chlorine is used for disinfection, the nonpotable water shall contain not more than 4 ppm (4mg/L) of chloramines or free chlorine when tested in accordance with ASTM D 1253. Where ozone is used for disinfection, the nonpotable water shall not contain gas bubbles having elevated levels of ozone at the point of use.

Exception: Reclaimed water sources shall not be required to comply with these requirements.

1301.2.2 Filtration required. Nonpotable water utilized for water closet and urinal flushing applications shall be filtered by a 100-micron or finer filter.

Exception: Reclaimed water sources shall not be required to comply with these requirements.

1301.3 Signage required. Nonpotable water outlets such as hose connections, open ended pipes and faucets shall be identified at the point of use for each outlet with signage that reads as follows: "Nonpotable water is utilized for [application name]. CAUTION: NONPOTABLE WATER – DO NOT DRINK." The words shall be legibly and 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 inch (12.7 mm) in height and in colors in contrast to the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure 1301.3 shall appear on the signage required by this section.

1301.4 Permits. Permits shall be required for the construction, installation, alteration and repair of nonpotable water systems. Construction documents, engineering calculations, diagrams and other such data pertaining to the nonpotable water system shall be submitted with each permit application.

1301.5 Potable water connections. Where a potable system is connected to a nonpotable water system, the potable water supply shall be protected against backflow in accordance with Section 608.

1301.6 Components and materials. Piping, plumbing components and materials used in collection and conveyance systems shall be of material approved by the manufacturer for the intended application.

1301.7 Insect and vermin control. The system shall be protected to prevent the entrance of insects and vermin into storage tanks and piping systems. Screen materials shall be compatible with contacting system components and shall not accelerate the corrosion of system components.



FIGURE 1301.3
PICTOGRAPH—DO NOT DRINK

1301.8 Freeze protection. Where sustained freezing temperatures occur, provisions shall be made to keep storage tanks and the related piping from freezing.

1301.9 Nonpotable water storage tanks. Nonpotable water storage tanks shall comply with Sections 1301.9.1 through 1301.9.10.

1301.9.1 Location. Any storage tank or portion thereof that is above grade shall be protected from direct exposure to sunlight by one of the following methods:

Tank construction using opaque, UV-resistant materials such as heavily tinted plastic, fiberglass, lined metal, concrete, wood, or painted to prevent algae growth.

Specially constructed sun barriers.

Installation in garages, crawl spaces or sheds.

1301.9.2 Materials. Where collected on site, water shall be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. The storage tank shall be constructed of materials compatible with any disinfection systems used to treat water upstream of the tank and with any systems used to maintain water quality in the tank. Wooden storage tanks that are not equipped with a makeup water source shall be provided with a flexible liner.

1301.9.3 Foundation and supports. Storage tanks shall be supported on a firm base capable of withstanding the weight of the storage tank when filled to capacity. Storage tanks shall be supported in accordance with the *Arkansas Fire Prevention Code*.

1301.9.3.1 Ballast. Where the soil can become saturated, an underground storage tank shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the weight of the storage tank when full, consistent with the bearing capability of adjacent soil.

1301.9.3.2 Structural support. Where installed below grade, storage tank installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when empty or filled with water.

1301.9.4 Makeup water. Where an uninterrupted supply is required for the intended application, potable or reclaimed water shall be provided as a source of makeup water for the storage tank. The makeup water supply shall be protected against backflow in accordance with Section 608. A *full-open valve* located on the makeup water supply line to the storage tank shall be provided. Inlets to the storage tank

shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. Where makeup water is provided, the water level shall not be permitted to drop below the source water inlet or the intake of any attached pump.

1301.9.5 Overflow. The storage tank shall be equipped with an overflow pipe having a diameter not less than that shown in Table 606.5.4. The overflow pipe shall be protected from insects or vermin and shall discharge in a manner consistent with storm water runoff requirements of the jurisdiction. The overflow pipe shall discharge at a sufficient distance from the tank to avoid damaging the tank foundation or the adjacent property. Drainage from overflow pipes shall be directed to prevent freezing on roof walkways. The overflow drain shall not be equipped with a shutoff valve. A cleanout shall be provided on each overflow pipe in accordance with Section 708.

1301.9.6 Access. Not less than one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an *approved* locking device or other *approved* method of securing access. Below-grade storage tanks, located outside of the building, shall be provided with a manhole either not less than 24 inches (610 mm) square or with an inside diameter not less than 24 inches (610 mm). Manholes shall extend not less than 4 inches (102 mm) above ground or shall be designed to prevent water infiltration. Finished grade shall be sloped away from the manhole to divert surface water. Manhole covers shall be secured to prevent unauthorized access. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be not less than 4 inches (102 mm) above the finished grade level. The service port shall be secured to prevent unauthorized access.

Exception: Treated-water storage tanks that are less than 800 gallons (3028 L) in volume and installed below grade shall not be required to be equipped with a manhole provided that the tank has a service port of not less than 8 inches (203 mm) in diameter.

1301.9.7 Venting. Storage tanks shall be provided with a vent sized in accordance with Chapter 9 and based on the aggregate diameter of all tank influent pipes. The reservoir vent shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of an *approved* cap or U-bend installed with the opening directed downward. Vent outlets shall extend not less than 4 inches (102 mm) above grade or as necessary to prevent surface water from entering the storage tank. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section 1301.7.

1301.9.8 Draining of tanks. Tanks shall be provided with a means of emptying the contents for the purpose of service or cleaning. Tanks shall be drained by using a pump or by a drain located at the lowest point in 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. Not less than one cleanout shall be provided on each drain pipe in accordance with Section 708.

1301.9.9 Marking and signage. Each nonpotable water storage tank shall be labeled with its rated capacity. The contents of storage tanks shall be identified with the words "CAUTION: NONPOTABLE WATER – DO NOT DRINK." Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, "DANGER – CONFINED SPACE." Markings shall be indelibly printed on the tank or on a tag or sign constructed of corrosion-resistant waterproof material that is mounted on the tank. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied.

1301.9.10 Storage tank tests. Storage tanks shall be tested in accordance with the following:

Storage tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.

After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and that there are no leaks.

The tank drain shall be observed for proper operation.

The makeup water system shall be observed for proper operation and successful automatic shutoff of the system at the refill threshold shall be verified.

1301.10 System abandonment. If the owner of an on-site nonpotable water reuse system or rainwater collection and conveyance system elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with the following:

All system piping connecting to a utility-provided water system shall be removed or disabled.

The distribution piping system shall be replaced with an *approved* potable water supply piping system. Where an existing potable pipe system is already in place, the fixtures shall be connected to the existing system.

The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

1301.11 Trenching requirements for nonpotable water piping. Nonpotable water collection and distribution piping and reclaimed water piping shall be separated from the *building sewer* and potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Nonpotable water collection and distribution piping

shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried nonpotable water piping shall comply with the requirements of Section 306.

Exceptions:

The required separation distance shall not apply where the bottom of the nonpotable water pipe within 5 feet (1524 mm) of the *sewer* is not less than 12 inches (305 mm) above the top of the highest point of the *sewer* and the pipe materials conform to Table 702.3.

The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the nonpotable water pipe is not less than 12 inches (305 mm) above the top of the highest point of the nonpotable water pipe and the pipe materials comply with the requirements of Table 605.4.

Nonpotable water pipe is permitted to be located in the same trench with a *building sewer*, provided that such *sewer* is constructed of materials that comply with the requirements of Table 702.2.

The required separation distance shall not apply where a nonpotable water pipe crosses a *sewer* pipe, provided that the pipe is sleeved to not less than 5 feet (1524 mm) horizontally from the *sewer* pipe centerline on both sides of such crossing, with pipe materials that comply with Table 702.3.

The required separation distance shall not apply where a potable water service pipe crosses a nonpotable water pipe, provided that the potable water service pipe is sleeved for a distance of not less than 5 feet (1524 mm) horizontally from the centerline of the nonpotable pipe on both sides of such crossing, with pipe materials that comply with Table 702.2.

Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where nonpotable water is used for outdoor applications.

1301.12 Outdoor outlet access. Sillcocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by nonpotable water shall be located in a locked vault or shall be operable only by means of a removable key.

SECTION 1302 ON-SITE NONPOTABLE WATER REUSE SYSTEMS

1302.1 General. The provisions of ASTM E 2635 and Section 1302 shall govern the construction, installation, alteration and repair of on-site nonpotable water reuse systems for the collection, storage, treatment and distribution of on-site sources of nonpotable water as permitted by the jurisdiction.

1302.2 Sources. On-site nonpotable water reuse systems shall collect waste discharge from only the following sources: bathtubs, showers, lavatories, clothes

washers and laundry trays. Where *approved* and as appropriate for the intended application, water from other nonpotable sources shall be collected for reuse by on-site nonpotable water reuse systems.

1302.2.1 Prohibited sources. Waste water containing urine or fecal matter shall not be diverted to on-site nonpotable water reuse systems and shall discharge to the sanitary drainage system of the building or premises in accordance with Chapter 7. Reverse osmosis system reject water, water softener discharge water, kitchen sink waste water, dishwasher waste water and waste water discharged from wet-hood scrubbers shall not be collected for reuse in an on-site nonpotable water reuse system.

1302.3 Traps. Traps serving fixtures and devices discharging waste water to on-site nonpotable water reuse systems shall comply with Section 1002.4.

1302.4 Collection pipe. On-site nonpotable water reuse systems shall utilize drainage piping *approved* for use in plumbing drainage systems to collect and convey untreated water for reuse. Vent piping *approved* for use in plumbing venting systems shall be utilized for vents in the gray water system. Collection and vent piping materials shall comply with Section 702.

1302.4.1 Installation. Collection piping conveying untreated water for reuse shall be installed in accordance with Section 704.

1302.4.2 Joints. Collection piping conveying untreated water for reuse shall utilize joints *approved* for use with the distribution piping and appropriate for the intended applications as specified in Section 705.

1302.4.3 Size. Collection piping conveying untreated water for reuse shall be sized in accordance with drainage sizing requirements specified in Section 710.

1302.4.4 Labeling and marking. Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 7.

1302.5 Filtration. Untreated water collected for reuse shall be filtered as required for the intended end use. Filters shall be provided with *access* for inspection and maintenance. Filters shall utilize a pressure gauge or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.

1302.6 Disinfection and treatment. Where the intended application for nonpotable water collected on site for reuse requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Nonpotable water collected on site containing untreated gray water shall be retained in collection reservoirs for not longer than 24 hours.

1302.6.1 Gray water used for fixture flushing. Gray water used for flushing water closets and urinals shall be disinfected and treated by an on-site water reuse treatment system complying with NSF 350.

**TABLE 1302.7.1
LOCATION OF NONPOTABLE WATER REUSE STORAGE TANKS**

<u>ELEMENT</u>	<u>MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)</u>
<u>Critical root zone (CRZ) of protected trees</u>	<u>2</u>
<u>Lot line adjoining private lots</u>	<u>5</u>
<u>Seepage pits</u>	<u>5</u>
<u>Septic tanks</u>	<u>5</u>
<u>Water wells</u>	<u>50</u>
<u>Streams and lakes</u>	<u>50</u>
<u>Water service</u>	<u>5</u>
<u>Public water main</u>	<u>10</u>

For SI: 1 foot = 304.8 mm.

1302.7 Storage tanks. Storage tanks utilized in on-site non-potable water reuse systems shall comply with Sections 1301.9, 1302.7.1 and 1302.7.2.

1302.7.1 Location. Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table 1302.7.1.

1302.7.2 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

1302.8 Valves. Valves shall be supplied on on-site nonpotable water reuse systems in accordance with Sections 1302.8.1 and 1302.8.2.

1302.8.1 Bypass valve. One three-way diverter valve listed and labeled to NSF 50 or other *approved* device shall be installed on collection piping upstream of each storage tank, or drainfield, as applicable, to divert untreated on-site reuse sources to the sanitary sewer to allow servicing and inspection of the system. Bypass valves shall be installed downstream of fixture traps and vent connections. Bypass valves shall be marked to indicate the direction of flow, connection and storage tank or drainfield connection. Bypass valves shall be provided with *access* that allows for removal. Two shutoff valves shall not be installed to serve as a bypass valve.

1302.8.2 Backwater valve. One or more backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section 714.

1302.9 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be easily accessible and removable in order to perform repair, maintenance and cleaning. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section 604.

1302.10 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the nonpotable water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1302.11 Distribution pipe. Distribution piping utilized in on-site nonpotable water reuse systems shall comply with Sections 1302.11.1 through 1302.11.3.

Exception: Irrigation piping located outside of the building and downstream of a backflow preventer.

1302.11.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section 605.

1302.11.2 Design. On-site nonpotable water reuse distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1302.11.3 Marking. On-site nonpotable water distribution piping labeling and marking shall comply with Section 608.9.

1302.12 Tests and inspections. Tests and inspections shall be performed in accordance with Sections 1302.12.1 through 1302.12.6.

1302.12.1 Collection pipe and vent test. Drain, waste and vent piping used for on-site water reuse systems shall be tested in accordance with Section 312.

1302.12.2 Storage tank test. Storage tanks shall be tested in accordance with Section 1301.9.10.

1302.12.3 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section 312.5.

1302.12.4 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.10.

1302.12.5 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section 1301.7.

1302.12.6 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the jurisdiction.

1302.13 Operation and maintenance manuals. Operation and maintenance materials shall be supplied with nonpotable on-site water reuse systems in accordance with Sections 1302.13.1 through 1302.13.4.

1302.13.1 Manual. A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

1302.13.2 Schematics. The manual shall include a detailed system schematic, and the locations and a list of all system components, including manufacturer and model number.

1302.13.3 Maintenance procedures. The manual shall provide a schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

1302.13.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

SECTION 1303 NONPOTABLE RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS

1303.1 General. The provisions of Section 1303 shall

govern the construction, installation, alteration and repair of rainwater collection and conveyance systems for the collection, storage, treatment and distribution of rainwater for nonpotable applications, as permitted by the jurisdiction.

1303.1.1 Fire protection systems. The storage, treatment and distribution of nonpotable water to be used for fire protection systems shall be in accordance with the *Arkansas Fire Prevention Code*.

1303.2 Collection surface. Rainwater shall be collected only from above-ground impervious roofing surfaces constructed from *approved* materials and where *approved*, vehicular parking or pedestrian walking surfaces.

1303.3 Debris excluders. Downspouts and leaders shall be connected to a debris excluder or equivalent device that is designed to remove leaves, sticks, pine needles and similar debris to prevent such from entering the storage tank.

1303.4 First-flush diverter. First-flush diverters shall operate automatically and shall not rely on manually operated valves or devices. Diverted rainwater shall not be drained to the roof surface, and shall be discharged in a manner consistent with the storm water runoff requirements of the jurisdiction. First-flush diverters shall be provided with *access* for maintenance and service.

1303.5 Roof gutters and downspouts. Gutters and downspouts shall be constructed of materials that are compatible with the collection surface and the rainwater quality for the desired end use. Joints shall be water tight.

1303.5.1 Slope. Roof gutters, leaders and rainwater collection piping shall slope continuously toward collection inlets. Gutters and downspouts shall have a slope of not less than $\frac{1}{8}$ inch per foot (10.4 mm/m) along their entire length, and shall not permit the collection or pooling of water at any point.

Exception: Siphonic drainage systems installed in accordance with the manufacturer's instructions shall not be required to have a slope.

1303.5.2 Size. Gutters and downspouts shall be installed and sized in accordance with Section 1106.6 and local rainfall rates.

1303.5.3 Cleanouts. Cleanouts shall be provided in the water conveyance system to allow *access* to all filters, flushes, pipes and downspouts.

1303.6 Drainage. Water drained from the roof washer or debris excluder shall not be drained to the sanitary sewer. Such water shall be diverted from the storage tank and discharge in a location that will not cause erosion or damage to property in accordance with the *Arkansas Fire Prevention Code*. Roof washers and debris excluders shall be provided with an automatic means of self-draining between rain events, and shall

not drain onto roof surfaces.

1303.7 Collection pipe. Rainwater collection and conveyance systems shall utilize drainage piping *approved* for use within plumbing drainage systems to collect and convey captured rainwater. Vent piping *approved* for use within plumbing venting systems shall be utilized for vents within the rainwater system. Collection and vent piping materials shall comply with Section 702.

1303.7.1 Installation. Collection piping conveying captured rainwater shall be installed in accordance with Section 704.

1303.7.2 Joints. Collection piping conveying captured rainwater shall utilize joints *approved* for use with the distribution piping and appropriate for the intended applications as specified in Section 705.

1303.7.3 Size. Collection piping conveying captured rainwater shall be sized in accordance with drainage sizing requirements specified in Section 710.

1303.7.4 Marking. Additional marking of collection piping conveying captured rainwater for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 7.

1303.8 Filtration. Collected rainwater shall be filtered as required for the intended end use. Filters shall be provided with *access* for inspection and maintenance. Filters shall utilize a pressure gauge or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

1303.9 Disinfection. Where the intended application for rainwater requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Where chlorine is used for disinfection or treatment, water shall be tested for residual chlorine in accordance with ASTM D 1253. The levels of residual chlorine shall not exceed that allowed for the intended use in accordance with the requirements of the jurisdiction.

1303.10 Storage tanks. Storage tanks utilized in nonpotable rainwater collection and conveyance systems shall comply with Sections 1301.9 and 1303.10.1 through 1303.10.3.

1303.10.1 Location. Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table 1303.10.1.

1303.10.2 Inlets. Storage tank inlets shall be designed to introduce collected rainwater into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the storage tank.

1303.10.3 Outlets. Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

1303.11 Valves. Valves shall be supplied on rainwater collection and conveyance systems in accordance with Section 1303.11.1.

1303.11.1 Backwater valve. Backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section 714.

1303.12 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be provided with *access* that allows for removal in order to perform repair, maintenance and cleaning. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section 604.

1303.13 Water pressure-reducing valve or regulator. Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the rainwater distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1303.14 Distribution pipe. Distribution piping utilized in rainwater collection and conveyance systems shall comply with Sections 1303.14.1 through 1303.14.3.

Exception: Irrigation piping located outside of the building and downstream of a backflow preventer.

1303.14.1 Materials, joints and connections. Distribution piping shall conform to the standards and requirements specified in Section 605 for nonpotable water.

1303.14.2 Design. Distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1303.14.3 Marking. Nonpotable rainwater distribution piping labeling and marking shall comply with Section 608.9.

1303.15 Tests and inspections. Tests and inspections shall be performed in accordance with Sections 1303.15.1 through 1303.15.9.

1303.15.1 Roof gutter inspection and test. Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section 1303.5.1. Gutters shall be tested by pouring not less than 1 gallon (3.8 l) of water into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.

1303.15.2 First-flush diverter test. First-flush diverters shall be tested by introducing water into the collection system upstream of the diverter. Proper diversion of the first amount of water shall be in accordance with the requirements of Section 1303.4.

1303.15.3 Collection pipe and vent test. Drain, waste and vent piping used for rainwater collection and conveyance systems shall be tested in accordance with Section 312.

1303.15.4 Storage tank test. Storage tanks shall be tested in accordance with Section 1301.9.10.

1303.15.5 Water supply system test. The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section 312.5.

1303.15.6 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.10.

1303.15.7 Inspection of vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section 1301.7.

1303.15.8 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the jurisdiction.

**TABLE 1303.10.1
LOCATION OF RAINWATER STORAGE TANKS**

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)
Critical root zone (CRZ) of protected trees	<u>2</u>
Lot line adjoining private lots	<u>5</u>
Seepage pits	<u>5</u>
Septic tanks	<u>5</u>

1303.15.9 Collected raw rainwater quality. ASTM E 2727 shall be used to determine what, if any, site conditions impact the quality of collected raw rainwater and whether those site conditions require treatment of the raw water for the intended end use or make the water unsuitable for specific end uses.

1303.16 Operation and maintenance manuals. Operation and maintenance manuals shall be supplied with rainwater collection and conveyance systems in accordance with Sections 1303.16.1 through 1303.16.4.

1303.16.1 Manual. A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

1303.16.2 Schematics. The manual shall include a detailed system schematic, and locations and a list of all system components, including manufacturer and model number.

1303.16.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

1303.16.4 Operations procedures. The manual shall include system startup and shutdown procedures, as well as detailed operating procedures.

SECTION 1304 RECLAIMED WATER SYSTEMS

1304.1 General. The provisions of this section shall govern the construction, installation, alteration and repair of systems supplying nonpotable reclaimed water.

1304.2 Water pressure-reducing valve or regulator. Where the reclaimed water pressure supplied to the building exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the reclaimed water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1304.3 Reclaimed water systems. The design of the reclaimed water systems shall conform to *accepted engineering practice*.

1304.3.1 Distribution pipe. Distribution piping shall comply with Sections 1304.3.1.1 through 1304.3.1.3.

Exception: Irrigation piping located outside of the building and downstream of a backflow preventer.

1304.3.1.1 Materials, joints and connections. Distribution piping conveying reclaimed water shall conform to standards and requirements specified in Section 605 for nonpotable water.

1304.3.1.2 Design. Distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1304.3.1.3 Labeling and marking. Nonpotable distribution piping labeling and marking shall comply with Section 608.9.

1304.4 Tests and inspections. Tests and inspections shall be performed in accordance with Sections 1304.4.1 and 1304.4.2.

1304.4.1 Water supply system test. The testing of makeup water supply piping and reclaimed water distribution piping shall be conducted in accordance with Section 312.5.

1304.4.2 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers shall be conducted in accordance with Section 312.10.

CHAPTER ~~12~~¹⁴

REFERENCED STANDARDS

User note:

About this chapter: This code contains numerous references to standards that are used to provide requirements for materials and methods of construction. Chapter ~~12~~¹⁴ contains a comprehensive list of all standards that are referenced in this code. These standards, in essence, are part of this code to the extent of the reference to the standard.

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.8.

ANSI

American National Standards Institute, 25 West 43rd Street, 4th Floor New York, NY 10036

Z21.22—99 (R2003): Relief Valves for Hot Water Supply Systems with Addenda Z21.22a—2000 (R2003) and Z21.22b—2001 (R2003)

504.2, 504.4, 504.4.1

ASHRAE

ASHRAE

1791 Tullie Circle NE

Atlanta, GA 30329

ASHRAE 18—2008 (RA13): Method of Testing for Rating Drinking-Water Coolers with Self-contained Mechanical Refrigeration (ANSI/ASHRAE Approved)

410.1

A S M E

American Society of Mechanical Engineers

Two Park Avenue

New York, NY 10016-5990

A112.1.2—2012: Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water Connection Receptors) 406.1, 409.2, Table 608.1, 608.14.1

A112.1.3—2000 (R2015): Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances 406.1, 409.2, Table 608.1, 608.14.1, 1102.6

A112.3.1—2007 (R2012): Stainless Steel Drainage Systems for Sanitary, DWV, Storm and Vacuum Applications Above and Below Ground

413.1, Table 702.1, Table 702.2, Table 702.3, Table 702.4, Table 1102.4, Table 1102.5, 1102.6, Table 1102.7

ASME A112.3.4—2013/CSA B45.9—2013: Macerating Toilet Systems and Related Components 405.5, 712.4.1

A112.4.1—2009: Water Heater Relief Valve Drain Tubes

504.6

A112.4.2—2015/CSA B45.16—15: Water Closet Personal Hygiene Devices

412.9

A112.4.3—1999 (R2010): Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System

405.4

A112.4.14—2004 (R2016): Manually Operated, Quarter-turn Shutoff Valves for Use in Plumbing Systems

Table 605.7

A112.6.2—2000 (R2016): Framing-affixed Supports for Off-the-floor Water Closets with Concealed Tanks

405.4.3

A112.6.3—2001 (R2016): Floor and Trench Drains

413.1

A112.6.4—2003 (R2012): Roof, Deck, and Balcony Drains

1102.6

A112.6.7—2010 (R2015): Sanitary Floor Sinks

414.1

A112.6.9—2005 (R2015): Siphonic Roof Drains

1107.1

A112.14.1—2003 (R2012): Backwater Valves

714.2

A112.14.3—2016: Grease Interceptors

1003.3.5

A112.14.4—2001 (R2012): Grease Removal Devices

1003.3.5

A112.14.6—2010 (R2015): FOG (Fats, Oils and Greases) Disposal Systems

1003.3.3, 1003.3.5, 1003.3.7

A112.18.1—2017/CSA B125.1—2017: Plumbing Supply Fittings

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