**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 International 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 or 14.

701.3 Separate Sewer Connection

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. Where located on the same lot, 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

Waste 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 Engineered Systems

Engineered sanitary drainage systems shall conform to the provisions of Sections 316 and 713.

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.

TABLE 702.1

ABOVE-GROUND 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 D2661; ASTM F628; ASTM F1488; CSA B181.1

Cast-iron pipe ASTM A74; ASTM A888; CISPI 301

Copper or copper-alloy pipe ASTM B42; ASTM B43; ASTM B302

Copper or copper-alloy tubing (Type K, L, M or DWV) ASTM B75; ASTM B88; ASTM B251; ASTM B306

Galvanized steel pipe ASTM A53

Glass pipe ASTM C1053

Polyolefin pipe ASTM F1412; CSA B181.3

Polyvinyl chloride (PVC) 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 D2665; ASTM F891; ASTM F1488; CSA B181.2

Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall ASTM D2949; ASTM F1488

Polyvinylidene fluoride (PVDF) plastic pipe ASTM F1673; CSA B181.3

Stainless steel drainage systems, Types 304 and 316L ASME A112.3.1

702.2 Underground Building Sanitary Drainage and Vent Pipe

Diagram

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

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 D2661; ASTM F628; ASTM F1488; CSA B181.1

Cast-iron pipe ASTM A74; ASTM A888; CISPI 301

Copper or copper-alloy tubing (Type K, L, M or DWV) ASTM B75; ASTM B88; ASTM B251; ASTM B306

Polyethylene (PE) plastic pipe (SDR-PR) ASTM F714

Polyolefin pipe ASTM F714; ASTM F1412; CSA B181.3

Polyvinyl chloride (PVC) 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 D2665; ASTM F891; ASTM F1488; CSA B181.2

Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall ASTM D2949; ASTM F1488

Polyvinylidene fluoride (PVDF) plastic pipe ASTM F1673; CSA B181.3

Stainless steel drainage systems, Type 316L ASME A112.3.1

For SI: 1 inch = 25.4 mm.

Upcodes Diagrams

702.3 Building Sewer Pipe

Diagram

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

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 composite wall ASTM D2661; ASTM D2680; ASTM F628; ASTM F1488; CSA B181.1

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 ASTM D2751; ASTM F1488

Cast-iron pipe ASTM A74; ASTM A888; CISPI 301

Concrete pipe ASTM C14; ASTM C76; CSA A257.1; CSA A257.2

Copper or copper-alloy tubing (Type K or L) ASTM B75; ASTM B88; ASTM B251

Polyethylene (PE) plastic pipe (SDR-PR) ASTM F714

Polypropylene (PP) plastic pipe ASTM F2736; ASTM F2764; CSA B182.13

Polyvinyl chloride (PVC) 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 D2665; ASTM F891; ASTM F1488

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 ASTM F891; ASTM F1488; ASTM D3034; CSA B182.2; CSA B182.4

Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall ASTM D2949; ASTM F1488

Polyvinylidene fluoride (PVDF) plastic pipe ASTM F1673; CSA B181.3

Stainless steel drainage systems, Types 304 and 316L ASME A112.3.1

Vitrified clay pipe ASTM C4; ASTM C700

For SI: 1 inch = 25.4 mm.

Upcodes Diagrams

702.4 Fittings

Diagram

Pipe fittings shall be approved for installation with the piping material installed and shall comply with the applicable standards listed in Table 702.4.

TABLE 702.4

PIPE FITTINGS

MATERIAL STANDARD

Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters ASME A112.4.4; ASTM D2661; ASTM F628; CSA B181.1

Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters ASTM D2751

Cast iron ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301

Copper or copper alloy ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29

Glass ASTM C1053

Gray iron and ductile iron AWWA C110/A21.10

Polyethylene ASTM D2683

Polyolefin ASTM F1412; CSA B181.3

Polyvinyl chloride (PVC) plastic in IPS diameters ASME A112.4.4; ASTM D2665; ASTM F1866

Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters ASTM D3034

Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. ASTM D2949

Polyvinylidene fluoride (PVDF) plastic pipe ASTM F1673; CSA B181.3

Stainless steel drainage systems, Types 304 and 316L ASME A112.3.1

Steel ASME B16.9; ASME B16.11; ASME B16.28

Vitrified clay ASTM C700

For SI: 1 inch = 25.4 mm.

Upcodes Diagrams

702.5 Temperature Rating

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

702.6 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.

702.7 Lead Bends and Traps

The wall thickness of lead bends and traps shall be not less than 1/8 inch (3.2 mm).

Section 703 Building Sewer

Diagram

UpCodes Diagrams

P

Cleanouts: Bldg. Sewers

703.1 Building Sewer Pipe Near the Water Service

The proximity of a sewer to a water service shall comply with Section 603.2.

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, PVC plastic pipe or polypropylene plastic pipe indicated 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 Building 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.

703.5 Cleanouts on Building Sewers

Diagram

Cleanouts on building sewers shall be located as indicated in Section 708.

UpCodes Diagrams

P

Plumbing Cleanout Clearances

Cleanouts: Installation Arrangement

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.

Section 704 Drainage Piping Installation

Upcodes Diagrams

704.1 Slope of Horizontal Drainage Piping

Diagram

Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The slope of a horizontal drainage pipe shall be 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)

21/2 or less 1/4a

3 to 6 1/8a

8 or larger 1/16a

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.33 mm/m.

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

UpCodes Diagrams

P

Slope of Horizontal Drainage Piping

704.2 Reduction in Pipe Size in the Direction of Flow

Diagram

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

A 4-inch by 3-inch (102 mm by 76 mm) water closet flange.

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.

An offset closet flange.

Upcodes Diagrams

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. 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.

Upcodes Diagrams

704.4 Future Fixtures

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

704.5

Plumbing in structures with basements shall have a future vent that runs below the joist and is labeled future vent.

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 C1173, ASTM D3212 or CSA B602. 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 D2235 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 D2235, ASTM D2661, ASTM F628 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.

705.2.4 Push-Fit Joints

Push-fit DWV fittings shall be listed and labeled to ASME A112.4.4 and shall be installed in accordance with the manufacturer's instructions.

705.3 Cast Iron

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

705.3.1 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 1/8 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 acidproof cement shall be permitted.

705.3.2 Compression Gasket Joints

Compression gaskets for hub and spigot pipe and fittings shall conform to ASTM C564 and shall be tested to ASTM C1563. Gaskets shall be compressed when the pipe is fully inserted.

705.3.3 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 C1277 or ASTM C1540. The elastomeric sealing sleeve shall conform to ASTM C564 or CSA B602 and shall be provided with a center stop. Mechanical joint couplings shall be installed in accordance with the manufacturer's instructions.

705.4 Concrete Joints

Joints between concrete pipe and fittings shall be made with an elastomeric seal conforming to ASTM C443, ASTM C1173, CSA A257.3M or CSA B602.

705.5 Copper Pipe

Joints between copper or copper-alloy pipe or fittings shall comply with Sections 705.5.1 through 705.5.5.

705.5.1 Brazed Joints

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.

705.5.2 Mechanical Joints

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

705.5.3 Solder Joints

Solder joints shall be made in accordance with the methods of ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32.

705.5.4 Threaded Joints

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

705.5.5 Welded Joints

Joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.

705.6 Copper Tubing

Joints between copper or copper-alloy tubing or fittings shall comply with Sections 705.6.1 through 705.6.3.

705.6.1 Brazed Joints

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.

705.6.2 Mechanical Joints

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

705.6.3 Solder Joints

Solder joints shall be made in accordance with the methods of ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32.

705.7 Borosilicate Glass Joints

Glass-to-glass connections shall be made with a bolted compression-type, 300 series stainless steel coupling with contoured acid-resistant elastomeric compression ring and a fluorocarbon polymer inner seal ring; or with caulked joints in accordance with Section 705.7.1.

705.7.1 Caulked Joints

Lead-caulked joints 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) in depth and not to recede more than 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.

705.8 Steel

Joints between galvanized steel pipe or fittings shall comply with Sections 705.8.1 and 705.8.2.

705.8.1 Threaded Joints

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

705.8.2 Mechanical Joints

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

705.9 Lead

Joints between lead pipe or fittings shall comply with Sections 705.9.1 and 705.9.2.

705.9.1 Burned

Burned joints shall be uniformly fused together into one continuous piece. The thickness of the joint shall be not less than the thickness of the lead being joined. The filler metal shall be of the same material as the pipe.

705.9.2 Wiped

Joints shall be fully wiped, with an exposed surface on each side of the joint not less than 3/4 inch (19.1 mm). The joint shall be not less than 3/8 inch (9.5 mm) thick at the thickest point.

705.10 PVC Plastic

Joints between PVC plastic pipe or fittings shall comply with Sections 705.10.1 through 705.10.3.

705.10.1 Mechanical Joints

Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D3212 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.

705.10.2 Solvent Cementing

Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F656 shall be applied. Solvent cement not purple in color and conforming to ASTM D2564, 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 D2855. Solvent-cement joints shall be permitted above or below ground.

705.10.3 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. 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.

705.10.4 Push-Fit Joints

Push-fit joints shall conform to ASME A112.4.4 and shall be installed in accordance with the manufacturer's instructions.

705.11 Vitrified Clay

Joints between vitrified clay pipe or fittings shall be made with an elastomeric seal conforming to ASTM C425, ASTM C1173 or CSA B602.

705.12 Polyethylene Plastic Pipe

Joints between polyethylene plastic pipe and fittings shall be underground and shall comply with Section 705.12.1 or 705.12.2.

705.12.1 Heat-Fusion Joints

Joint surfaces shall be clean and free from moisture. 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 D2657 and the manufacturer's instructions.

705.12.2 Mechanical Joints

Mechanical joints in drainage piping shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D3212 or CSA B602. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

705.13 Polyolefin Plastic

Joints between polyolefin plastic pipe and fittings shall comply with Sections 705.13.1 and 705.13.2.

705.13.1 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 F1412 or CSA B181.3.

705.13.2 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 fittings 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 F1673.

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 D3212. Mechanical joints shall not be installed above ground.

705.16 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 C1173, ASTM C1460 or ASTM C1461. Connectors and adapters shall be approved for the application and such joints shall have an elastomeric seal conforming to ASTM C425, ASTM C443, ASTM C564, ASTM C1440, ASTM F477, CSA A257.3M or CSA B602, or as required in Sections 705.16.1 through 705.16.7. 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.

705.16.1 Copper Pipe or Tubing to Cast-Iron Hub Pipe

Joints between copper pipe or tubing and cast-iron hub pipe shall be made with a copper or copper-alloy ferrule or compression joint. The copper pipe or 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.

705.16.2 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 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.

705.16.3 Cast-Iron Pipe to Galvanized Steel Pipe

Joints between cast iron and galvanized steel shall be made by either caulked or threaded joints or with an approved adapter fitting.

705.16.4 Plastic Pipe or Tubing to Other Piping Material

Joints between different types of plastic pipe 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 other piping material shall be made with an approved adapter fitting. Joints between plastic pipe and cast-iron hub pipe shall be made by a caulked joint or a mechanical compression joint.

705.16.5 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.

705.16.6 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.

705.16.7 Stainless Steel Drainage Systems to Other Materials

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

705.17 Drainage Slip Joints

Slip joints shall comply with Section 405.9.

705.18 Caulking Ferrules

Caulking ferrules shall be of copper alloy and shall be in accordance with Table 705.18.

TABLE 705.18

CAULKING FERRULE SPECIFICATIONS

PIPE SIZES (inches) INSIDE DIAMETER (inches) LENGTH (inches) MINIMUM WEIGHT EACH

2 21/4 41/2 1 pound

3 31/4 41/2 1 pound 12 ounces

4 41/4 41/2 2 pounds 8 ounces

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

705.19 Soldering Bushings

Soldering bushings shall be of copper or copper alloy and shall be in accordance with Table 705.19.

TABLE 705.19

SOLDERING BUSHING SPECIFICATIONS

PIPE SIZES (inches) MINIMUM WEIGHT EACH

11/4 6 ounces

11/2 8 ounces

2 14 ounces

21/2 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.

705.20 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

Connections 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.

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 Xa Xa

Short sweep X Xa,b Xa

Long sweep X X X

Sanitary tee Xc — —

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.

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:

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

Upcodes Diagrams

708.1 Cleanouts Required

Cleanouts shall be provided for drainage piping in accordance with Sections 708.1.1 through 708.1.12.

708.1.1 Horizontal Drains and Building Drains

Diagram

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 nonremovable trap shall not be required to have a cleanout for the section of piping between the trap and the vent connection for such trap.

UpCodes Diagrams

P

Cleanouts: Horiz. Drains & Bldg. Drains

708.1.2 Building Sewers

Diagram

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.

Upcodes Diagrams

708.1.3 Building Drain and Building Sewer Junction

Diagram

The junction of the building drain and the building sewer shall be served by a cleanout that is located at the junction or within 10 feet (3048 mm) of the developed length of piping upstream of the junction. For the requirements of this section, the removal of the water closet shall not be required to provide cleanout access.

UpCodes Diagrams

P

Cleanouts: Installation Arrangement

Cleanouts: Bldg. Drain & Bldg. Sewer Junction

708.1.4 Changes of Direction

Diagram

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.

Upcodes Diagrams

708.1.5 Cleanout Size

Diagram

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.

UpCodes Diagrams

P

Cleanouts: Size

708.1.6 Cleanout Equivalent

A fixture trap or a fixture with integral trap, removable without altering concealed piping, shall be acceptable as a cleanout equivalent.

708.1.7 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.

708.1.8 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.

708.1.9 Installation Arrangement

Diagram

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.

Upcodes Diagrams

708.1.10 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.

Upcodes Diagrams

708.1.11 Cleanout Access

Diagram

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 11/2 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.

UpCodes Diagrams

P

Cleanouts Access: Prohibited Locations

708.1.11.1 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.

708.1.11.2 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.

708.1.12 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.

Section 709 Fixture Units

709.1 Values for Fixtures

Diagram

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.

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, commerciala, g 3 2

Automatic clothes washers, residentialg 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 —

Bathtubb (with or without overhead shower or whirlpool attachments) 2 11/2

Bidet 1 11/4

Combination sink and tray 2 11/2

Dental lavatory 1 11/4

Dental unit or cuspidor 1 11/4

Dishwashing machinec, domestic 2 11/2

Drinking fountain 1/2 11/4

Emergency floor drain 0 2

Floor drainsh 2h 2

Floor sinks Note h 2

Kitchen sink, domestic 2 11/2

Kitchen sink, domestic with food waste disposer, dishwasher or both 2 11/2

Laundry tray (1 or 2 compartments) 2 11/2

Lavatory 1 11/4

Shower (based on the total flow rate through showerheads and body sprays) flow rate:

5.7 gpm or less

Greater than 5.7 gpm to 12.3 gpm

Greater than 12.3 gpm to 25.8 gpm

Greater than 25.8 gpm to 55.6 gpm

2

3

5

6

11/2

2

3

4

Service sink 2 11/2

Sink 2 11/2

Urinal 4 Note d

Urinal, 1 gallon per flush or less 2e Note d

Urinal, nonwater supplied 1/2 Note d

Wash sink (circular or multiple) each set of faucets 2 11/2

Water closet, flushometer tank, public or private 4e Note d

Water closet, private (1.6 gpf) 3e Note d

Water closet, private (flushing greater than 1.6 gpf) 4e Note d

Water closet, public (1.6 gpf) 4e Note d

Water closet, public (flushing greater than 1.6 gpf) 6e Note d

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

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 709.4.1 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 bathroom group, add the dfu value of those additional fixtures to the bathroom group fixture count.

See Section 406.2 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.

UpCodes Diagrams

P

Urinals and Partitions (ADA)

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 11/4 inches (32 mm).

TABLE 709.2

DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR TRAPS

FIXTURE DRAIN OR TRAP SIZE (inches) DRAINAGE FIXTURE UNIT VALUE

11/4 1

11/2 2

2 3

21/2 4

3 5

4 6

For SI: 1 inch = 25.4 mm.

709.3 Conversion of GPM Flow to DFU Values

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 drainage 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.

Upcodes Diagrams

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.

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).

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 DRAINa

Slope per foot

1/16 inch 1/8 inch 1/4 inch 1/2 inch

11/4 — — 1 1

11/2 — — 3 3

2 — — 21 26

21/2 — — 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.

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

TABLE 710.1(2)

HORIZONTAL FIXTURE BRANCHES AND STACKSa

DIAMETER OF PIPE (inches) MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)

Total for horizontal branch Stacksb

Total discharge into one branch interval Total for stack of three branch intervals or less Total for stack greater than three branch intervals

11/2 3 2 4 8

2 6 6 10 24

21/2 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.

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 711.3.

710.1.2 Vertical Stack Offsets

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

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 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 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].

711.2.1 Omission of Vents for Horizontal Stack Offsets

Vents for horizontal stack offsets required by Section 711.2 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.

711.3 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

Diagram

Upcodes Diagrams

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.

Upcodes Diagrams

712.2 Valves Required

Diagram

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.

UpCodes Diagrams

P

Valve Requirements at Sanitary Sumps and Ejectors

712.3 Sump Design

Diagram

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

UpCodes Diagrams

P

Sump Design

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, unless otherwise approved. The pit shall be provided with access and shall be 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 gastight removable cover that is installed not more than 2 inches (51 mm) below 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 and Fittings

Discharge pipe 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.

712.3.3.1 Materials

Pipe and fitting materials shall be constructed of copper or copper-alloy, 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 Connection to the Drainage System

Pumps connected to the drainage system shall connect to a 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 a wye fitting into the top of the drainage piping and such wye fitting shall be located not less than from the base of any soil stack, waste stack or fixture drain. The waste line from sewage crock injector pump shall be the last connection leaving before the drain line goes through the foundation.

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 ASME A112.3.4/CSA B45.9 and shall be installed in accordance with the manufacturer's 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 1/2 inch (13 mm). The capacity of a pump or ejector based on the diameter of the discharge pipe shall be not less than that indicated in Table 712.4.2.

Exceptions:

Grinder pumps or grinder ejectors that receive the discharge of water closets shall have a discharge opening of not less than 11/4 inches (32 mm).

Macerating toilet assemblies that serve single water closets shall have a discharge opening of not less than 3/4 inch (19.1 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

21/2 30

3 46

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

Section 713 Computerized Drainage Design

713.1 Design of Drainage System

The sizing, design and layout of the drainage system shall be permitted to be designed by approved computer design methods.

713.2 Load on Drainage System

The load shall be computed from the simultaneous or sequential discharge conditions from fixtures, appurtenances and appliances or the peak usage design condition.

713.2.1 Fixture Discharge Profiles

The discharge profiles for flow rates versus time from fixtures and appliances shall be in accordance with the manufacturer's specifications.

713.3 Selections of Drainage Pipe Sizes

Pipe shall be sized to prevent full-bore flow.

713.3.1 Selecting Pipe Wall Roughness

Pipe size calculations shall be conducted with the pipe wall roughness factor (ks), in accordance with the manufacturer's specifications and as modified for aging roughness factors with deposits and corrosion.

713.3.2 Slope of Horizontal Drainage Piping

Horizontal drainage piping shall be designed and installed at slopes in accordance with Table 704.1.

Section 714 Backwater Valves

714.1 Sewage Backflow

Diagram

Where plumbing fixtures are installed on a floor with a 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, or horizontal branch serving such fixtures. Plumbing fixtures installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve.

Exception: In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not be prohibited from discharging through a backwater valve.

Upcodes Diagrams

714.2 Material

Backwater valves shall comply with ASME A112.14.1, CSA B181.1 or CSA B181.2.

714.3 Location

Backwater valves shall be installed so that access is provided to the working parts.

Section 715 Vacuum Drainage Systems

715.1 Scope

Vacuum drainage systems shall be in accordance with Sections 715.2 through 715.4.

715.2 System Design

Vacuum drainage systems shall be designed in accordance with the vacuum drainage system manufacturer's instructions. 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. 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 Fixtures

Gravity-type fixtures installed in vacuum drainage systems shall comply with Chapter 4.

715.2.2 Drainage Fixture Units

Drainage 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 Water Supply Fixture Units

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

715.2.4 Traps and Cleanouts

Gravity drainage fixtures shall be provided with traps and cleanouts in accordance with this chapter and Chapter 10.

715.2.5 Materials

Vacuum drainage pipe, fitting and valve materials shall be in accordance with the vacuum drainage system manufacturer's instructions and the requirements of this chapter.

715.3 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 code official and the manufacturer of the vacuum drainage system. Recorded proof of all tests shall be submitted to the code official.

715.4 Written Instructions

Written instructions for the operation, maintenance, safety and emergency procedures shall be provided to the building owner. 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

Diagram

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.

UpCodes Diagrams

P

Plumbing Cleanout Clearances

Cleanouts: Installation Arrangement

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.

Section 717 Relining Building Sewers and Building Drains

717.1 General

This section shall govern the relining of existing building sewers and building drainage piping.

717.2 Applicability

The relining of existing building sewers and building drainage piping shall be limited to gravity drainage piping 4 inches (102 mm) in diameter and larger. The relined piping shall be of the same nominal size as the existing piping.

717.3 Preinstallation Requirements

Prior to commencement of the relining installation, the existing piping sections to be relined shall be descaled and cleaned. After the cleaning process has occurred and water has been flushed through the system, the piping shall be inspected internally by a recorded video camera survey.

717.3.1 Preinstallation Recorded Video Camera Survey

The video survey shall include verification of the project address location. The video shall include notations of the cleanout and fitting locations, and the approximate depth of the existing piping. The video shall also include notations of the length of piping at intervals not greater than 25 feet (7620 mm).

717.4 Permitting

Prior to permit issuance, the code official shall review and evaluate the preinstallation recorded video camera survey to determine if the piping system is able to be relined in accordance with the proposed lining system manufacturer's installation requirements and applicable referenced standards.

717.5 Prohibited Applications

Where review of the preinstallation recorded video camera survey reveals that piping systems are not installed correctly or defects exist, relining shall not be permitted. The defective portions of piping shall be exposed and repaired with pipe and fittings in accordance with this code. Defects include, but are not limited to, backgrade or insufficient slope, complete pipe wall deterioration or complete separations such as from tree root invasion or improper support.

717.6 Relining Materials

The relining materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. Fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.

717.7 Installation

The installation of relining materials shall be performed in accordance with the manufacturer's installation instructions, applicable referenced standards and this code.

717.7.1 Material Data Report

The installer shall record the data as required by the relining material manufacturer and applicable standards. The recorded data shall include but is not limited to the location of the project, relining material type, amount of product installed and conditions of the installation. A copy of the data report shall be provided to the code official prior to final approval.

717.8 Post-Installation Recorded Video Camera Survey

The completed, relined piping system shall be inspected internally by a recorded video camera survey after the system has been flushed and flow-tested with water. The video survey shall be submitted to the the code official prior to finalization of the permit. The video survey shall be reviewed and evaluated to provide verification that no defects exist. Any defects identified shall be repaired and replaced in accordance with this code.

717.9 Certification

A certification shall be provided in writing to the code official, from the permit holder, that the relining materials have been installed in accordance with the manufacturer's installation instructions, the applicable standards and this code.

717.10 Approval

Upon verification of compliance with the requirements of Sections 717.1 through 717.9, the code official shall approve the installation.

Section 718 Rehabilitation of Building Sewers and Building Drains

718.1 Cure-in-Place

Sectional cure-in-place rehabilitation of building sewer piping and sewer service lateral piping shall be in accordance with ASTM F2599. Main and lateral cure-in-place rehabilitation of building sewer and sewer service lateral pipe and their connections to the main sewer pipe shall be in accordance with ASTM F2561. Hydrophilic rings or gaskets in cure-in-place rehabilitation of building sewer piping and sewer service laterals shall be in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration.



































