

## **4101:3-7-01 Sanitary Drainage.**

*[Comment: When a reference is made within this rule to a federal statutory provision, an industry consensus standard, or any other technical publication, the specific date and title of the publication as well as the name and address of the promulgating agency are listed in rule 4101:3-15-01 of the Administrative Code. The application of the referenced standards shall be limited and as prescribed in section 102.5 of rule 4101:1-1-01 of the Administrative Code.]*

### **SECTION 701 GENERAL**

**701.1 Scope.** The provisions of this chapter shall govern the materials, design, construction and installation of sanitary drainage systems. *In accordance with section 3781.03 of the Revised Code, the department of the city engineer, in cities having such departments, the boards of health districts, or the sewer purveyor, as appropriate, shall have complete supervision and regulation of the entire sewerage and drainage system of the jurisdiction, including the building sewer and all laterals draining into the street sewers.*

***Exception:** Private sewage disposal systems within the scope of the “Ohio Department of Health” rules contained within Chapter 3701-29 of the Administrative Code, “Household Sewage Disposal Systems”.*

**701.2 Sewer required.** *Except where permitted by the “Ohio Environmental Protection Agency”, every building in which plumbing fixtures are installed and premises having drainage piping shall be connected to a public sewer, where available, or an approved private sewage disposal system.*

**701.3 Separate sewer connection.** *Except where permitted by the “Ohio Environmental Protection Agency”, every 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 *without prior approval from the “Ohio Environmental Protection Agency” for the form of treatment and for the location of discharge.*

**701.5 Damage to drainage system or public sewer.** *Except where permitted by the "Ohio Environmental Protection Agency", 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 requirements of the local sewer purveyor.*

**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 106.5 of the building code and 714.

**701.8 ~~Drainage piping in food service areas.~~** ~~Exposed soil or waste piping shall not be installed above any areas used for food preparation or storage, or above storage or eating surfaces in food service establishments.~~ **Reuse of existing sanitary drainage piping.** *Reuse of existing sanitary drainage piping shall comply with Section 3404.1.1 of the building code.*

## 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.** *Deleted.*

**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 D 2661; ASTM F 628; ASTM F 1488; CSA B181.1
Brass pipe	ASTM B 43
Cast-iron pipe	ASTM A 74; ASTM A 888; CISPI 301

Copper or copper-alloy pipe	ASTM B 42; 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	ASTM F 1412; 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 D 2665; ASTM F 891; ASTM F 1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D 2949, ASTM F 1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F 1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

**702.4 Fittings.** Pipe fittings shall be approved for installation with the piping material installed and shall comply with the applicable 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.

**702.6 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  $\frac{1}{8}$  inch (3.2 mm).

**TABLE 702.2  
UNDERGROUND BUILDING DRAINAGE AND VENT PIPE**

MATERIAL	STANDARD
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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; ASTM F 1488; CSA B181.1
Cast-iron pipe	ASTM A 74; ASTM A 888; CISPI 301
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B 75; ASTM B 88; ASTM B 251; ASTM B 306
Polyolefin pipe	ASTM F 1412; 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 D 2665; ASTM F 891; ASTM F 1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D 2949, ASTM F 1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F 1673; CSA B181.3
Stainless steel drainage systems, Type 316L	ASME A 112.3.1

For SI: 1 inch = 25.4 mm.

**TABLE 702.3 BUILDING SEWER PIPE Deleted.**

**TABLE 702.4  
PIPE FITTINGS**

<b>MATERIAL</b>	<b>STANDARD</b>
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters	ASTM D 2661; ASTM F 628; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters	ASTM D 2751
Cast iron	ASME B 16.4; ASME B 16.12; ASTM A 74; ASTM A 888; CISPI 301

Copper or copper alloy	ASME B 16.15; ASME B 16.18; ASME B 16.22; ASME B 16.23; ASME B 16.26; ASME B 16.29
Glass	ASTM C 1053
Gray iron and ductile iron	AWWA C 110/A21.10
Malleable iron	ASME B 16.3
Polyolefin	ASTM F 1412; CSA B181.3
Polyvinyl chloride (PVC) plastic in IPS diameters	ASTM D 2665; ASTM F 1866
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters	ASTM D 3034
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D.	ASTM D 2949
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F 1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A 112.3.1
Steel	ASME B 16.9; ASME B 16.11; ASME B 16.28
Vitrified clay	ASTM C 700

For SI: 1 inch = 25.4 mm.

## **SECTION 703 BUILDING SEWER**

**703.1 Building sewer pipe near the water service.** *Deleted.*

**703.2 Drainage pipe in filled ground.** *Deleted.*

**703.3 Sanitary and storm sewers.** *Deleted.*

**703.4 Existing building sewers and drains.** *Deleted.*

**703.5 Cleanouts on building sewers.** *Deleted.*

**703.6 Combined sanitary and storm public sewer.** *Deleted.*

## 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 slope of a horizontal drainage pipe shall be not less than that indicated in Table 704.1.

**TABLE 704.1  
SLOPE OF HORIZONTAL DRAINAGE PIPE**

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

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

**704.2 Change in size.** The size of the drainage piping shall not be reduced in size in the direction of the flow. A 4-inch by 3-inch (102 mm by 76 mm) water closet connection shall not be considered as a reduction in size.

**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.

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

## 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 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 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 Brass.** Joints between brass pipe or fittings shall comply with Sections 705.3.1 through 705.3.4.

**705.3.1 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.

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

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

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

**705.4 Cast iron.** Joints between cast-iron pipe or fittings shall comply with Sections 705.4.1 through 705.4.3.

**705.4.1 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  $\frac{1}{8}$  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.

**705.4.2 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.

**705.4.3 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 instructions.

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

**705.6 Copper pipe.** Joints between copper or copper-alloy pipe or fittings shall comply with Sections 705.6.1 through 705.6.5.

**705.6.1 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.

**705.6.2 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 B 828. 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.

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

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

**705.7 Copper tubing.** Joints between copper or copper-alloy tubing or fittings shall comply with Sections 705.7.1 through 705.7.3.

**705.7.1 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.

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

**705.7.3 Solder joints.** Solder joints shall be made in accordance with the methods of ASTM B 828. 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.

**705.8 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 705.8.1.

**705.8.1 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  $\frac{1}{8}$  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.

**705.9 Steel.** Joints between galvanized steel pipe or fittings shall comply with Sections 705.9.1 and 705.9.2.

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

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

**705.10 Lead.** Joints between lead pipe or fittings shall comply with Sections 705.10.1 and 705.10.2.

**705.10.1 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.

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

**705.11 PVC plastic.** Joints between PVC plastic pipe or fittings shall comply with Sections 705.11.1 through 705.11.3.

**705.11.1 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.

**705.11.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A primer that conforms to ASTM F 656 shall be applied. Solvent cement conforming to ASTM D 2564, 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.

**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 D 2564.
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.

**705.11.3 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.

**705.12 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.

**705.13 Polyethylene plastic pipe.** Joints between polyethylene plastic pipe and fittings shall be underground and shall comply with Section 705.13.1 or 705.13.2.

**705.13.1 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.

**705.13.2 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.

**705.14 Polyolefin plastic.** Joints between polyolefin 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 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.

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

**705.15 Polyvinylidene fluoride plastic.** Joints between polyvinylidene plastic pipe and fittings shall comply with Sections 705.15.1 and 705.15.2.

**705.15.1 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 F 1673.

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

**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 C 1173, 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 F 477, 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 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 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.

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

**705.16.3 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.

**705.16.4 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. 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 405.8.

**705.18 Caulking ferrules.** Ferrules shall be of red brass 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	2 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	1 pound
3	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	1 pound 12 ounces
4	4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	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 red brass and shall be in accordance with Table 705.19.

**TABLE 705.19  
SOLDERING BUSHING SPECIFICATIONS**

PIPE SIZES (inches)	MINIMUM WEIGHT EACH
1 <sup>1</sup> / <sub>4</sub>	6 ounces
1 <sup>1</sup> / <sub>2</sub>	8 ounces
2	14 ounces
2 <sup>1</sup> / <sub>2</sub>	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.** All 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	X <sup>a</sup>	X <sup>a</sup>
Short sweep	X	X <sup>a,b</sup>	X <sup>a</sup>
Long sweep	X	X	X
Sanitary tee	X <sup>c</sup>	—	—
Wye	X	X	X

Combination wye and eighth bend	X	X	X
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For SI: 1 inch = 25.4 mm.

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

1. Cement or concrete joints.
2. Mastic or hot-pour bituminous joints.
3. Joints made with fittings not approved for the specific installation.
4. Joints between different diameter pipes made with elastomeric rolling O-rings.
5. Solvent-cement joints between different types of plastic pipe.
6. 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 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.

**708.1.2 Building sewers.** *Deleted.*

**708.1.3 Building drain and building sewer junction.** 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.

**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:**

1. 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.
2. Cleanouts located on stacks can be one size smaller than the stack size.
3. 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 brass, plastic or other approved materials. Cleanout plugs for borosilicate glass piping systems shall be of borosilicate glass. Brass cleanout plugs shall conform to ASTM A 74 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:**

1. Test tees serving as cleanouts.
2. 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 1<sup>1</sup>/<sub>2</sub> 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.

## 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<sup>1</sup>/<sub>4</sub> inches (32 mm).

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

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

For SI: 1 inch = 25.4 mm.

**709.3 Values for continuous and semicontinuous flow.** Drainage fixture unit values for continuous and semicontinuous flow into a drainage system 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.

## 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 DRAIN <sup>a</sup>			
	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 709.1  
DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS**

<b>FIXTURE TYPE</b>	<b>DRAINAGE FIXTURE UNIT VALUE AS LOAD FACTORS</b>	<b>MINIMUM SIZE OF TRAP (inches)</b>
Automatic clothes washers, commercial <sup>a,e</sup>	<i>Note a</i>	<i>Note a</i>
Automatic clothes washers, residential <sup>e</sup>	2	2
Bathroom group as defined in Section 202 (1.6 gpf water closet) <sup>f</sup>	5	—
Bathroom group as defined in Section 202 (water closet flushing greater than 1.6 gpf) <sup>f</sup>	6	—
Bathtub <sup>b</sup> (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 <sup>c</sup> , domestic	2	1½
Drinking fountain	½	1¼
Emergency floor drain	0	2
Floor drains <sup>h</sup>	2h	2
Floor sinks	<i>Note h</i>	2
Kitchen sink, domestic	2	1½
Kitchen sink, domestic with food waste disposer and/or dishwasher	2	1½
Laundry tray (1 or 2 compartments)	2	1½
Lavatory	1	1¼

Shower (based on the total flow rate through showerheads and body sprays) Flow rate: 5.7 gpm or less	2	1½
Greater than 5.7 gpm to 12.3 gpm	3	2
Greater than 12.3 gpm to 25.8 gpm	5	3
Greater than 25.8 gpm to 55.6 gpm	6	4
Service sink	2	1½
Sink	2	1½
Urinal	4	Note d
Urinal, 1 gallon per flush or less	2e	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	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, gpm = gallon per minute.

- a. Calculate *per Section 709.3*.
- b. A showerhead over a bathtub or whirlpool bathtub attachment does not increase the drainage fixture unit value.
- c. 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.
- d. Trap size shall be consistent with the fixture outlet size.
- e. 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.
- f. For fixtures added to a bathroom group, add the dfu value of those additional fixtures to the bathroom group fixture count.
- g. See Section 406.2 for sizing requirements for fixture drain, branch drain and drainage stack for an automatic clothes washer standpipe.
- h. See Sections 709.4 and 709.4.1.

**TABLE 710.1(2)  
HORIZONTAL FIXTURE BRANCHES AND STACKS<sup>a</sup>**

DIAMETER OF PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)	
	Total for	Stacks <sup>b</sup>

	horizontal branch	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.

- a. Does not include branches of the building drain. Refer to Table 710.1(1).
- b. 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 711.3.

**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 ~~906~~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:

1. 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.
2. The offset shall be sized in accordance with Section 710.1.1.
3. 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**

**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.

*Exception: In buildings where the "Residential Code of Ohio" applies, only a check valve shall be required, located on the discharge piping from the sewage pump or ejector.*

**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, 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 gastight 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 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 and shall be approved.

**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 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 10 pipe diameters from the base of any soil stack, waste stack or fixture drain.

**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 inch (25 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:**

1. Grinder pumps or grinder ejectors that receive the discharge of water closets shall have a discharge opening of not less than  $1\frac{1}{4}$  inches (32 mm).
2. Macerating toilet assemblies that serve single water closets shall have a discharge opening of not less than  $\frac{3}{4}$  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)
$\frac{3}{4}$ -2	21
$2\frac{1}{2}$	30
3	46

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

### SECTION 713 HEALTH CARE PLUMBING

**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.** 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 be not less than  $\frac{1}{2}$ -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 be not 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.

**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 be not 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 so as 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 the purpose of 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  $1\frac{1}{2}$  inches (38 mm) in diameter. Multiple installations shall be sized in accordance with Table 713.11.1.

**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	CONNECTION SIZE
---------------	--------------------

(inches)	1½"		2"
1½a	1	or	0
2a	2	or	1
2b	1	and	1
3a	4	or	2
3b	2	and	2
4a	8	or	4
4b	4	and	4

For SI: 1 inch = 25.4 mm.

a. Total of each size.

b. Combination of sizes.

**713.11.2 Boiling-type sterilizers.** The size of a sterilizer vent *stack* shall be not less than 2 inches (51 mm) in diameter where serving a utensil sterilizer and not less than 1½ 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 2½ 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 diameter of a sterilizer vent stack serving an instrument washer sterilizer shall be not less than 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 713.11.3**  
**STACK SIZES FOR PRESSURE STERILIZERS (Number of**  
**Connections of Various Sizes Permitted To Various-sized Vent**  
**Stacks)**

STACK SIZE (inches)	CONNECTION SIZE			
	¾"	1"	1¼"	1½"
1½a	3 or	2 or	1	—
1½b	2 and	1	—	—
2a	6 or	3 or	2 or	1
2b	3 and	2	—	—
2b	2 and	1 and	1	—

2b	1 and	1 and	—	1
3a	15 or	7 or	5 or	3
3b	1 and	1 and 5 and	2 and	2 1

For SI: 1 inch = 25.4 mm.

a. Total of each size.

b. Combination of sizes.

## SECTION 714 COMPUTERIZED DRAINAGE DESIGN

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

**714.2 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.

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

**714.3 Selections of drainage pipe sizes.** Pipe shall be sized to prevent full-bore flow.

**714.3.1 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.

**714.3.2 Slope of horizontal drainage piping.** Horizontal drainage piping shall be designed and installed at slopes in accordance with Table 704.1.

## SECTION 715 BACKWATER VALVES

**715.1 Sewage backflow.** *If required by the "Ohio Environmental Protection Agency" or local sewer purveyor, a backwater valve shall be installed only for plumbing fixtures 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.

**715.2 Material.** 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.

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

## **SECTION 716 VACUUM DRAINAGE SYSTEMS**

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

**716.2 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.

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

**716.2.2 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.

**716.2.3 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.

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

**716.2.5 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.

**716.3 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.

**716.4 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 717 REPLACEMENT OF UNDERGROUND SEWERS BY PIPE-BURSTING METHODS**

**717.1 General.** *Deleted.*

**717.2 Applicability.** *Deleted.*

**717.3 Pre-installation inspection.** *Deleted.*

**717.4 Pipe.** *Deleted.*

**717.5 Pipe fittings.** *Deleted.*

**717.6 Cleanouts.** *Deleted.*

**717.7 Post-installation inspection.** *Deleted.*

**717.8 Pressure testing.** *Deleted.*