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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 $\frac{1}{2}$  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.

**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 $\frac{1}{4}$  inches (32 mm).

TABLE 709.2  
DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR TRAPS

Fixture drain or trap size (inches)	Drainage fixture unit value
1 $\frac{1}{4}$	1
1 $\frac{1}{2}$	2
2	3
2 $\frac{1}{2}$	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>			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
1 $\frac{1}{4}$	—	—	1	1
1 $\frac{1}{2}$	—	—	3	3
2	—	—	21	26
2 $\frac{1}{2}$	—	—	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**

Fixture Type	Drainage Fixture Unit Value as Load Factors	Minimum Size of Trap (inches)
Automatic clothes washers, commercial <sup>a,g</sup>	3	2
Automatic clothes washers, residential <sup>g</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	1 <sup>1</sup> / <sub>2</sub>
Bidet	1	1 <sup>1</sup> / <sub>4</sub>
Combination sink and tray	2	1 <sup>1</sup> / <sub>2</sub>
Dental lavatory	1	1 <sup>1</sup> / <sub>4</sub>
Dental unit or cuspidor	1	1 <sup>1</sup> / <sub>4</sub>
Dishwashing machine <sup>c</sup> , domestic	2	1 <sup>1</sup> / <sub>2</sub>
Drinking fountain	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>4</sub>
Emergency floor drain	0	2
Floor drains <sup>h</sup>	2 <sup>h</sup>	2
Floor sinks	Note h	2
Kitchen sink, domestic	2	1 <sup>1</sup> / <sub>2</sub>
Kitchen sink, domestic with food waste disposer and/or dishwasher	2	1 <sup>1</sup> / <sub>2</sub>
Laundry tray (1 or 2 compartments)	2	1 <sup>1</sup> / <sub>2</sub>
Lavatory	1	1 <sup>1</sup> / <sub>4</sub>
Shower (based on the total flow rate through showerheads and body sprays)		
Flow rate:		
5.7 gpm or less	2	1 <sup>1</sup> / <sub>2</sub>
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	1 <sup>1</sup> / <sub>2</sub>
Sink	2	1 <sup>1</sup> / <sub>2</sub>
Urinal	4	Note d
Urinal, 1 gallon per flush or less	2 <sup>e</sup>	Note d
Urinal, nonwater supplied	1 <sup>1</sup> / <sub>2</sub>	Note d
Wash sink (circular or multiple) each set of faucets	2	1 <sup>1</sup> / <sub>2</sub>
Water closet, flushometer tank, public or private	4 <sup>e</sup>	Note d
Water closet, private (1.6 gpf)	3 <sup>e</sup>	Note d
Water closet, private (flushing greater than 1.6 gpf)	4 <sup>e</sup>	Note d
Water closet, public (1.6 gpf)	4 <sup>e</sup>	Note d
Water closet, public (flushing greater than 1.6 gpf)	6 <sup>e</sup>	Note d

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

- a. For traps larger than 3 inches, use Table 709.2.
- 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 406.3 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 horizontal branch	Stacks <sup>b</sup>		
		Total discharge into one branch interval	Total for stack of three branch intervals or less	Total for stack greater than three branch intervals
1 $\frac{1}{2}$	3	2	4	8
2	6	6	10	24
2 $\frac{1}{2}$	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 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.

**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