CHAPTER 7

SANITARY DRAINAGE

Part I – Drainage Systems.

701.0 Materials.

701.1 Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, Stainless Steel 304 or 316L, Schedule 40 ABS DWV, Schedule 40 PVC DWV, extra-strength vitrified clay pipe, or other approved materials having a smooth and uniform bore, except that:

701.1.1 No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept at least six (6) inches (152 mm) aboveground.

701.1.2 ABS and PVC DWV piping installations shall be installed in accordance with IS 5, IS 9, and Chapter 15 "Firestop Protection." Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, when tested in accordance with the Test for Surface - Burning Characteristics of the Building Materials. (See the Building Code standards based on ASTM E-84 and ANSI/UL 723.)

701.1.3 No vitrified clay pipe or fittings shall be used aboveground or where pressurized by a pump or ejector. They shall be kept at least twelve (12) inches (305 mm) belowground.

701.1.4 Copper tube for drainage and vent piping shall have a weight of not less than that of copper drainage tube type DWV.

701.1.5 Stainless steel 304 pipe and fittings shall not be installed underground and shall be kept at least 6 inches (152 mm) aboveground.

701.1.6 CPE may be used for exterior building storm drains and subsurface drains.

701.2 Drainage fittings shall be of cast iron, malleable iron, lead, brass, copper, ABS, PVC, vitrified clay, stainless steel 304 and 316L (304 shall not be installed underground and shall be kept at least 6 inches (152 mm) aboveground), or other approved materials having a smooth interior waterway of the same diameter as the piping served, and all such fittings shall be compatible with the type of pipe used.

701.2.1 Fittings on screwed pipe shall be of the recessed drainage type. Burred ends shall be reamed to the full bore of the pipe.

701.2.2 The threads of drainage fittings shall be tapped so as to allow one-quarter (1/4) inch per foot (20.9 mm/m) grade.

701.2.3 Fittings used for drainage shall be of the drainage type, have a smooth interior waterway, and be constructed so as to allow one fourth (1/4) inch per foot (20.9 mm/m) grade.

701.3 Lead.

See Table 14-1. Sheet lead shall be not less than the following:

For safe pans – not less than four (4) pounds per square foot (19.5 kg/m^2) or 1/16 inch (1.6 mm) thick.

TABLE 7-1
Caulking Ferrules

Pipe Size (inches)	Inside Diameter (inches)	Length (inches)	Minimum Weight Each lb.	oz.
2	2-1/4	4-1/2	1	0
3	3-1/4	4-1/2	1	12
4	4-1/4	4-1/2	2	8

Caulking Ferrules (Metric)

Pipe Size (mm)	Inside Diameter (mm)	Length (mm)	Minimum Weight Each (kg)
50	57	114	0.454
80	83	114	0.790
100	108	114	1.132

TABLE 7-2
Soldering Bushings

Pipe Size (inches)	Minimum Weight Each lb.	oz.	Pipe Size (inches)	Minimum Weight Each lb.	oz.
1-1/4	0	6	2-1/2	1	6
1-1/2	0	8	3	2	0
2	0	14	4	3	8

Soldering Bushings (Metric)

Pipe Size (mm)	Minimum Weight Each (kg)	Pipe Size (mm)	Minimum Weight Each (kg)
32	0.168	65	0.622
40	0.224	80	0.908
50	0.392	100	1.586

TABLE 7-3

Drainage Fixture Unit Values (DFU)

Inch	mm
1-1/4	32
1-1/2	40
2	50
2-1/2	65
3	80

Plumbing Appliance, Appurtenance, or Fixture	Min. Size Trap and Trap Arm[7]	Private	Public	Assembly[8]
Bathtub or Combination Bath/Shower	1-1/2"	2.0	2.0	
Bidet	1-1/4"	1.0		
Bidet	1-1/2"	2.0		
Clothes Washer, domestic, standpipe[5]	2"	3.0	3.0	3.0
Dental Unit, cuspidor	1-1/4"		1.0	1.0
Dishwasher, domestic, with independent drain	1-1/2"[2]	2.0	2.0	2.0
Drinking Fountain or Watercooler (per head)	1-1/4"	0.5	0.5	1.0
Food-Waste-Grinder, commercial	2"		3.0	3.0
Floor Drain, emergency	2"		0.0	0.0
Floor Drain (for additional sizes see Section 702)	2"	2.0	2.0	2.0
Shower, single-head trap	2"	2.0	2.0	2.0
Multi-head, each additional	2"	1.0	1.0	1.0
Lavatory, single	1-1/4"	1.0	1.0	1.0
Lavatory, in sets of two or three	1-1/2"	2.0	2.0	2.0
Washfountain	1-1/2"		2.0	2.0
Washfountain	2"		3.0	3.0
Mobile Home, trap	3"	12.0		
Receptor, indirect waste[1,3]	1-1/2"		See footnote [1,3]	
Receptor, indirect waste[1,4]	2"		See footnote [1,4]	
Receptor, indirect waste[1]	3"		See footnote [1]	
Sinks				
Bar	1-1/2"	1.0		
Bar	1-1/2"[2]		2.0	2.0
Clinical	3"		6.0	6.0
Commercial with food waste	1-1/2"[2]		3.0	3.0
Special Purpose	1-1/2"	2.0	3.0	3.0
Special Purpose	2"	3.0	4.0	4.0
Special Purpose	3"		6.0	6.0
Kitchen, domestic (with or without food-waste grinder and/or dishwasher)	1-1/2"[2]	2.0	2.0	
Laundry (with or without discharge from a clothes washer)	1-1/2"	2.0	2.0	2.0
Service or Mop Basin	2"		3.0	3.0
Service or Mop Basin	3"		3.0	3.0
Service, flushing rim	3"		6.0	6.0
Wash, each set of faucets			2.0	2.0
Urinal, integral trap 1.0 GPF[2]	2"	2.0	2.0	5.0
Urinal, integral trap greater than 1.0 GPF	2"	2.0	2.0	6.0
Urinal, exposed trap	1-1/2"[2]	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank[6]	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank[6]	3"	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve[6]	3"	3.0	4.0	6.0
Water Closet, greater than 1.6 GPF Gravity Tank[6]	3"	4.0	6.0	8.0
Water Closet, greater than 1.6 GPF Flushometer Valve[6]	3"	4.0	6.0	8.0

[1] Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain therein to, in accordance with Table 7-4.

[2] Provide a 2" (51 mm) minimum drain.

[3] For refrigerators, coffee urns, water stations, and similar low demands.

[4] For commercial sinks, dishwashers, and similar moderate or heavy demands.

[5] Buildings having a clothes-washing area with clothes washers in a battery of three (3) or more clothes washers shall be rated at six (6) fixture units each for purposes of sizing common horizontal and vertical drainage piping.

[6] Water closets shall be computed as six (6) fixture units when determining septic tank sizes based on Appendix K of this code.

[7] Trap sizes shall not be increased to the point where the fixture discharge may be inadequate to maintain their self-scouring properties.

[8] Assembly [Public Use (See Oregon Structural Specialty Code, Section 303)].

For flashings or vent terminals – not less than three (3) pounds per square foot (15 kg/m^2) or 1.2 mm thick.

Lead bends and lead traps shall not be less than one-eighth (1/8) inch (3.2 mm) wall thickness.

701.4 Ferrules and Bushings

701.4.1 Caulking ferrules shall be manufactured from bronze or copper and shall be in accordance with Table 7-1.

701.4.2 Soldering bushings shall be of bronze or copper in accordance with Table 7-2.

702.0 Fixture Unit Equivalents.

The unit equivalent of plumbing fixtures shown in Table 7-3 shall be based on the size of the trap required, and the unit equivalent of fixtures and devices not shown in Table 7-3 shall be based on the rated discharge capacity in gpm (gallons per minute) (liters per second) in accordance with Table 7-4.

Maximum trap loadings for sizes up to four (4) inches (102 mm) are as follows:

1-1/4 in.	(32 mm)	—	1 unit
1-1/2 in.	(40 mm)	—	3 units
2 in.	(50 mm)	—	4 units
3 in.	(80 mm)	—	6 units
4 in.	(100 mm)	—	8 units

Exception: On self-service laundries.

703.0 Size of Drainage Piping.

703.1 The minimum sizes of vertical and/or horizontal drainage piping shall be determined from the total of all fixture units connected thereto, and additionally, in the case of vertical drainage pipes, in accordance with their length.

703.2 Table 7-5 shows the maximum number of fixture units allowed on any vertical or horizontal drainage pipe, building drain, or building sewer of a given size; the maximum number of fixture units allowed on any branch interval of a given size; and the maximum length (in feet and meters) of any vertical drainage pipe of a given size.

TABLE 7-4

Discharge Capacity in Gallons per Minute (Liters per Second)

For Intermittent Flow Only

GPM	(L/sec)		
Up to 7-1/2	(Up to 0.47)	Equals	1 Unit
8 to 15	(0.50 to 0.95)	Equals	2 Units
16 to 30	(1.00 to 1.89)	Equals	4 Units
31 to 50	(1.95 to 3.15)	Equals	6 Units

Discharge capacity for over 50 gallons per minute (3.15 L/sec.) shall be determined by the Authority Having Jurisdiction.

For a continuous flow into a drainage system, such as from a pump, sump ejector, air conditioning equipment, or similar device, two (2) fixture units shall be allowed for each gallon per minute (0.06 L/sec.) of flow.

704.0 Fixture Connections (Drainage).

704.1 Drainage piping shall be provided with approved inlet fittings for fixture connections, correctly located according to the size and type of fixture proposed to be connected.

704.2 Two fixtures set back-to-back, or side-by-side, within the distance allowed between a trap and its vent may be served by a single vertical drainage pipe provided that each fixture wastes separately into an approved double-fixture fitting having inlet openings at the same level.

704.4 Closet Rings (Closet Flanges).

704.4.1 Closet rings (closet flanges) for water closets or similar fixtures shall be of an approved type and shall be bronze, copper, hard lead, cast iron, galvanized malleable iron, ABS, PVC, or other approved materials. Each such closet ring (closet flange) shall be approximately seven (7) inches (175 mm) in diameter and, when installed, shall, together with the soil pipe, present a one and one-half (1-1/2) inch (38 mm) wide flange or face to receive the fixture gasket or closet seal.

704.4.2 Caulked-on closet rings (closet flanges) shall be not less than one-fourth (1/4) inch (6.4mm) thick and not less than two (2) inches (51mm) in overall depth.

704.4.3 Closet rings (closet flanges) shall be burned or soldered to lead bends or stubs, shall be caulked to cast-iron soil pipe, shall be solvent cemented to ABS and PVC, and shall be screwed or fastened in an approved manner to other materials.

704.4.4 All such closet rings (closet flanges) shall be adequately designed and secured to support fixtures connected thereto.

704.4.5 Closet screws, bolts, washers, and similar fasteners shall be of brass, copper, or other listed, equally corrosion-resistant materials. All such screws and bolts shall be of adequate size and number to properly support the fixture installed.

TABLE 7-5
Maximum Unit Loading and Maximum Length of Drainage and Vent Piping

Size of Pipe, inches (mm)	**1-1/4** (32)	**1-1/2** (40)	**2** (50)	**2-1/2** (65)	**3** (80)	**4** (100)	**5** (125)	**6** (150)	**8** (200)	**10** (250)	**12** (300)
Maximum Units											
Drainage Piping[1]											
Vertical	1	2[2]	16[3]	32[3]	48[4]	256	600	1,380	3,600	5,600	8,400
Horizontal	1	2	8[3]	14[3]	35[4,5]	216[5]	428[5]	720[5]	2,640[5]	4,680[5]	8,200[5]
Maximum Length											
Drainage Piping											
Vertical, feet	45	65	85	148	212	300	390	510	750		
(m)	(14)	(20)	(26)	(45)	(65)	(91)	(119)	(155)	(228)		
Horizontal (unlimited)											
Vent Piping (See note)											
Horizontal and Vertical											
Maximum Units	1	8[3]	24	48	84	256	600	1,380	3,600		
Maximum Lengths, feet	45	60	120	180	212	300	390	510	750		
(m)	(14)	(18)	(37)	(55)	(65)	(91)	(119)	(155)	(228)		

[1] Excluding trap arm.
[2] Except sinks, urinals, and dishwashers.
[3] Except six-unit traps or water closets.
[4] Only four (4) water closets or six-unit traps allowed on any vertical pipe or stack; and not to exceed three (3) water closets or six-unit traps on any horizontal branch or drain.
[5] Based on one-fourth (1/4) inch per foot (20.9 mm/m) slope. For one-eighth (1/8) inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.

Note: The diameter of an individual vent shall not be less than one and one-fourth (1-1/4) inches (31.8 mm) nor less than one-half (1/2) the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Tables 7-3 and 7-4. Not to exceed one-third (1/3) of the total permitted length of any vent may be installed in a horizontal position. When vents are increased one (1) pipe size for their entire length, the maximum length limitations specified in this table do not apply.

705.0 Joints and Connections.

705.1 Types of Joints.

705.1.1 Caulked Joints. Caulked joints for cast-iron bell-and-spigot soil pipe and other similar joints shall be firmly packed with oakum or hemp and filled with molten lead to a depth of not less than one (1) inch (25.4 mm). The lead shall be caulked thoroughly at the inside and outside edges of the joint. After caulking, the finished joint shall not extend more than one-eighth (1/8) inch (3.2 mm) below the rim of the hub. No paint, varnish, or other coatings shall be permitted on the joining material until after the joint has been tested and approved. Caulked joints in cast-iron bell-and-spigot water piping shall be made with nontoxic materials.

705.1.2 Cement Mortar Joints. Except for repairs and connections to existing lines constructed with such joints, cement mortar joints shall be prohibited on building sewers.

705.1.3 Burned Lead Joints. Burned (welded) lead joints shall be lapped, and the lead shall be fused together to form a uniform weld at least as thick as the lead being joined.

705.1.4 Asbestos Cement Sewer Pipe Joints. Joints in asbestos cement pipe shall be a sleeve coupling of the same composition as the pipe or of other approved materials, and sealed with rubber rings or joined by an approved-type compression coupling. Joints between asbestos cement pipe and other approved pipe shall be made by means of an approved adapter coupling.

705.1.5 Packing Additives Prohibited. The addition of leak-sealing additives to joint packing shall be prohibited.

705.1.6 Molded Rubber Coupling Joints. When pipe is joined by means of molded rubber coupling joints, such joints shall conform to approved standards and shall not be considered as slip joints. When required, appropriate rubber bushings shall be used to allow for any difference in piping material diameters.

705.1.7 Elastomeric Gasketed and Rubber-Ring Joints. Elastomeric gasketed and rubber-ring joints shall comply with the applicable Installation Standard listed in Appendix I.

705.1.8 Shielded Coupling Joints. When piping systems are joined by means of shielded

couplings, such couplings shall conform to approved standards and shall not be considered as slip joints.

705.1.9 Hubless Cast-Iron Pipe Joints. Joints for hubless cast-iron soil pipe and fittings shall conform to appropriate Installation Standards listed in Appendix I and shall not be considered as slip joints.

705.2 Use of Joints.

705.2.1 Clay and Sewer Pipe. Joints in vitrified clay pipe or between such pipe and metal pipe shall be made as provided in Section 316.1.5, 705.1.2, 705.1.6, or 705.1.8.

705.2.2 Cast-Iron Pipe. Joints in cast-iron pipe shall be made as provided in Section 316.1.1, 316.1.5, 606.1.2, 705.1.1, 705.1.8, or 705.1.9.

705.2.3 Screw Pipe to Cast Iron. Joints between wrought iron, steel, brass, or copper pipe and cast-iron pipe shall be either caulked or threaded joints made as provided in Section 316.1.1 or 705.1.1, or shall be made with approved adapter fittings.

705.2.4 Lead to Cast Iron, Wrought Iron, or Steel. Joints between lead and cast-iron, wrought-iron, or steel pipe shall be made by means of wiped joints to a caulking ferrule, soldering nipple, or bushing as provided in Section 316.1.2.

705.3 Special Joints.

705.3.1 Slip Joints. In fixture drains and traps, slip joints of approved materials may be used in accordance with their approvals.

705.3.2 Expansion Joints. Expansion joints shall be accessible, except when in vent piping or drainage stacks, and may be used where necessary to provide for expansion and contraction of the pipes.

705.3.3 Ground Joint, Flared, or Ferrule Connections. Brass or copper ground joint, flared, or ferrule-type connections that allow adjustment of tubing, but provide a rigid joint when made up, shall not be considered as slip joints.

706.0 Changes in Direction of Drainage Flow.

706.1 Changes in direction of drainage piping shall be made by the appropriate use of approved fittings and shall be of the angles presented by a one-sixteenth (1/16) bend, one-eighth (1/8) bend, or one-sixth (1/6) bend, or other approved fittings of equivalent sweep.

706.2 Horizontal drainage lines, connecting with a vertical stack, shall enter through forty-five (45) degree (0.79 rad) wye branches, sixty (60) degree (1.05 rad) wye branches, combination wye and 1/8 bend branches, sanitary tee or sanitary tapped tee branches, or other approved fittings of equivalent sweep. No fitting having more than one (1) inlet at the same level shall be used unless such fitting is constructed so that the discharge from one (1) inlet cannot readily enter any other inlet. Double sanitary tees may be used when the barrel of the fitting is at least two (2) pipe sizes larger than the largest inlet, (pipe sizes recognized for this purpose are 2 in., 2-1/2 in., 3 in., 3-1/2 in., 4 in., 4-1/2 in., 5 in., 6 in., etc.) (50, 65, 80, 90, 100, 115, 125, 150 mm, etc.).

706.3 Horizontal drainage lines connecting with other horizontal drainage lines shall enter through forty-five (45) degree (0.79 rad) wye branches, combination wye and one-eighth (1/8) bend branches, or other approved fittings of equivalent sweep.

706.4 Vertical drainage lines connecting with horizontal drainage lines shall enter through forty-five (45) degree (0.79 rad) wye branches, combination wye and one-eighth (1/8) bend branches, or other approved fittings of equivalent sweep. Sixty (60) degree (1.05 rad) branches or offsets may be used only when installed in a true vertical position.

707.0 Cleanouts.

707.1 Each cleanout fitting for cast-iron pipe shall consist of a cast-iron or brass body and an approved plug. Each cleanout for galvanized wrought-iron, galvanized steel, copper, or brass pipe shall consist of a brass plug as specified in Table 7-6, or a standard weight brass cap, or an approved ABS or PVC plastic plug, or an approved stainless steel cleanout or plug. Plugs shall have raised square heads or approved countersunk rectangular slots.

707.2 Each cleanout fitting and each cleanout plug or cap shall be of an approved type.

707.3 Cleanouts shall be designed to be gas and watertight.

707.4 Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal, and each run of piping, that is more than one hundred (100) feet (30,480 mm) in total developed length, shall be provided with a cleanout for each one hundred (100) feet (30,480 mm), or fraction thereof, in length of such piping.

Exceptions:

(1) Cleanouts may be omitted on a horizontal drain line less than five (5) feet (1524 mm) in length unless such line is serving sinks or urinals.

(2) Cleanouts may be omitted on any horizontal

drainage pipe installed on a slope of seventy-two (72) degrees (1.26 rad) or less from the vertical angle (angle of one-fifth (1/5) bend).

(3) Excepting the building drain and its horizontal branches, a cleanout shall not be required on any pipe or piping that is above the floor level of the lowest floor of the building.

(4) An approved type of two-way cleanout fitting, installed inside the building wall near the connection between the building drain and the building sewer or installed outside of a building at the lower end of a building drain and extended to grade, may be substituted for an upper terminal cleanout.

707.5 An additional cleanout shall be provided in a drainage line for each aggregate horizontal change of direction exceeding one hundred and thirty-five (135) degrees (2.36 rad).

707.6 Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe.

707.7 Each cleanout extension shall be considered as drainage piping and each ninety (90) degree (1.6 rad) cleanout extension shall be extended from a wye-type fitting or other approved fitting of equivalent sweep.

707.8 Each cleanout for an interceptor shall be outside of such interceptor.

707.9 Each cleanout, unless installed under an approved cover plate, shall be above grade, readily accessible, and so located as to serve the purpose for which it is intended. Cleanouts located under cover plates shall be so installed as to provide the clearances and accessibility required by this section.

707.10 Each cleanout in piping two (2) inches (50 mm) or less in size shall be so installed that there is a clearance of not less than twelve (12) inches (305 mm) in front of the cleanout. Cleanouts in piping larger than two (2) inches (50 mm) shall have a clearance of not less than eighteen (18) inches (457 mm) in front of the cleanout. Cleanouts in under-floor piping shall be extended to or above the finished floor or shall be extended outside the building when there is less than eighteen (18) inches (457 mm) vertical overall, allowing for obstructions such as ducts, beams, and piping, and thirty (30) inches of (762 mm) horizontal clearance from the means of access to such cleanout. No under-floor cleanout shall be located more than twenty (20) feet (6096 mm) from an access door, trap door, or crawl hole.

707.11 Cleanout fittings shall be not less in size than those given in Table 7-6.

707.12 Cleanouts shall be provided for pressure drainage systems as classified under Section 710.7.

707.13 Countersunk cleanout plugs shall be installed where raised heads may cause a hazard.

707.14 When a hubless blind plug is used for a required cleanout, the complete coupling and plug shall be accessible for removal or replacement.

708.0 Grade of Horizontal Drainage Piping.

Horizontal drainage piping shall be run in practical alignment and a uniform slope of not less than one-fourth (1/4) inch per foot (20.9 mm/m) or two (2) percent toward the point of disposal provided that, where it is impractical due to the depth of the street sewer or to the structural features or to the

arrangement of any building or structure to obtain a slope of one-fourth (1/4) of an inch per foot (20.9 mm/m) or two (2) percent, any such pipe or piping three (3) inches (80 mm) or larger in diameter may have a slope of not less than one-eighth (1/8) of an inch per foot (10.5 mm/m) or one (1) percent, when first approved by the Authority Having Jurisdiction.

709.0 Gravity Drainage Required.

Table 7-6
Cleanouts

Size of Pipe (inches)	Size of Cleanout (inches)	Threads (per inches)
1-1/2	1-1/2	11-1/2
2	1-1/2	11-1/2
2-1/2	2-1/2	8
3	2-1/2	8
4 & larger	3-1/2	8

TABLE 7-6
Cleanouts (Metric)

Size of Pipe (mm)	Size of Cleanout (mm)	Threads (per 25.4 mm)
40	38	11-1/2
50	38	11-1/2
65	64	8
80	64	8
100 & larger	89	8

Wherever practicable, all plumbing fixtures shall be drained to the public sewer or private sewage disposal system by gravity.

710.0 Drainage of Fixtures Located Below the Next Upstream Manhole or Below the Main Sewer Level.

710.1 Where a fixture is installed on a floor level that is lower than the next upstream manhole cover of the public or private sewer, serving such drainage piping, shall be protected from backflow of sewage by installing an approved type of backwater valve. Fixtures on floor levels above such elevation shall not discharge through the backwater valve.

710.2 Drainage piping serving fixtures that are located below the crown level of the main sewer shall discharge into an approved watertight sump or receiving tank, so located as to receive the sewage or wastes by gravity. From such sump or receiving tank, the sewage or other liquid wastes shall be lifted and discharged into the building drain or building sewer by approved ejectors, pumps, or other equally efficient approved mechanical devices.

710.3 A sewage ejector or sewage pump receiving the discharge of water closets or urinals:

710.3.1 Shall have a minimum discharge capacity of twenty (20) gallons (75.7 liters) per minute.

710.3.2 In single dwelling units, the ejector or pump shall be capable of passing a one and one-half (1-1/2) inch (38 mm) diameter solid ball, and the discharge piping of each ejector or pump shall have a backwater valve and gate valve, and be a minimum of two (2) inches (51mm) in diameter.

710.3.3 In other than single-dwelling units, the ejector or pump shall be capable of passing a two (2) inch (51 mm) diameter solid ball, and the discharge piping of each ejector or pump shall have a backwater valve and gate valve, and be a minimum of three (3) inches (80 mm) in diameter.

710.4 The discharge line from such ejector, pump, or other mechanical device shall be provided with an accessible backwater or swing check valve and gate or ball valve. If the gravity drainage line to which such discharge line connects is horizontal, the method of connection shall be from the top through a wye branch fitting. The gate or ball valve shall be located on the discharge side of the backwater or check valve.

Gate or ball valves, when installed in drainage piping, shall be fullway type with working parts of corrosion-resistant metal. Sizes four (4) inches (100mm) or more in diameter shall have cast-iron bodies, and sizes less than four (4) inches (100 mm), cast-iron or brass bodies.

710.5 Building drains or building sewers receiving discharge from any pump or ejector shall be adequately sized to prevent overloading. Two (2) fixture units shall be allowed for each gallon per minute (0.06 L/s) of flow.

710.6 Backwater valves, gate valves, fullway ball valves, unions, motors, compressors, air tanks, and other mechanical devices required by this section shall be located where they will be accessible for inspection and repair at all times and, unless continuously exposed, shall be enclosed in a masonry pit fitted with an adequately sized removable cover.

Backwater valves shall have bodies of cast iron, plastic, brass, or other approved materials; shall have noncorrosive bearings, seats, and self-aligning discs; and shall be constructed so as to ensure a positive mechanical seal. Such backwater valves shall remain sufficiently open during periods of low flows to avoid screening of solids and shall not restrict capacities or cause excessive turbulence during peak loads. Unless otherwise listed, valve access covers shall be bolted type with gasket, and each valve shall bear the manufacturer's name cast into the body and the cover.

710.7 The drainage and venting systems, in connection with fixtures, sumps, receiving tanks, and mechanical waste-lifting devices, shall be installed under the same requirements as provided for in this code for gravity systems.

710.8 Sumps and receiving tanks shall be watertight and shall be constructed of concrete, metal, or other approved materials. If constructed of poured concrete, the walls and bottom shall be adequately reinforced and designed to recognized acceptable standards. Metal sumps or tanks shall be of such thickness as to serve their intended purpose and shall be treated internally and externally to resist corrosion.

710.9 All such sumps and receiving tanks shall be automatically discharged and, when in any "public use" occupancy, shall be provided with dual pumps or ejectors arranged to function alternately in normal use and independently in case of overload or mechanical failure. The pumps shall have an audio and visual alarm, readily accessible, that signals pump failure or an overload condition. The lowest inlet shall have a minimum clearance of two (2) inches (51 mm) from the high-water or "starting" level of the sump.

710.10 Sumps and receiving tanks shall be provided with substantial covers having a bolt-and-gasket-type manhole or equivalent opening to permit access for inspection, repairs, and cleaning. The top shall be provided with a vent pipe that shall extend separately through the roof or, when permitted, may be combined with other vent pipes. Such vent shall be large enough to maintain atmospheric pressure within the sump under all normal operating

conditions and, in no case, shall be less in size than that required by Table 7-5 for the number and type of fixtures discharging into the sump, nor less than one and one-half (1-1/2) inches (40 mm) in diameter. When the foregoing requirements are met and the vent, after leaving the sump, is combined with vents from fixtures discharging into the sump, the size of the combined vent need not exceed that required for the total number of fixtures discharging into the sump. No vent from an air-operating sewage ejector shall combine with other vents.

710.11 Air tanks shall be so proportioned as to be of equal cubical capacity to the ejectors connected therewith in which there shall be maintained an air pressure of not less than two (2) pounds for each foot (3 kg for each m) of height the sewage is to be raised. No water-operated ejectors shall be permitted.

710.12 Grinder Pump Ejector. Grinder pumps shall be permitted to be used.

710.13 Macerating Toilet Systems. Listed macerating toilet systems shall be permitted as an alternate to a sewage pump system when approved by the Authority Having Jurisdiction.

710.13.1 Sumps. The sump shall be water- and gastight.

710.13.2 Discharge Piping. The discharge piping shall be sized per manufacturer's instructions and shall be not less than 3/4 inches (20 mm) in diameter. The developed length of the discharge piping shall not exceed the manufacturer's recommendations. A check valve and fullway-type shutoff valve shall be located within the discharge line or internally within the device.

710.13.3 Venting. The plumbing fixtures that discharge into the macerating device shall be vented per this code. The sump shall be vented per manufacturer's instructions and such vent shall be permitted to connect to the fixture venting.

710.14 Elevator Pit Drains. Permanent means of drainage shall be provided for elevator pits. Gravity drains, when installed, shall be provided with an approved type backwater valve to prevent drain line backup and the trap seal shall be protected with an automatic trap seal primer. Sumps and pumps may be installed when provided with the following:

(1) A check valve to prevent water, gases, and odors from entering the pit.

(2) A secured and level cover over the sump.

(3) An automatic activation switch.

(4) A minimum 1/3hp rating.

(5) A minimum 1-1/4 inch (32mm) discharge pipe.

(6) Sump size as recommended by the manufacturer.

(7) The outlet pipe of the pump shall be directly or indirectly connected to the inlet of a primed "P" trap. The "P" trap shall be connected to the sanitary drainage system.

(8) Single pumps shall be permitted.

711.0 Suds Relief.

Drainage connections shall not be made into a drainage piping system within eight (8) feet (2438 mm) of any vertical to horizontal change of direction of a stack containing suds-producing fixtures. Bathtubs, laundries, washing machine standpipes, kitchen sinks, and dishwashers shall be considered suds-producing fixtures. Where parallel vent stacks are required, they shall connect to the drainage stack at a point eight (8) feet (2,438 mm) above the lowest point of the drainage stack.

Exceptions:

(1) Single-family residences.

(2) Stacks receiving the discharge from less than three (3) stories of plumbing fixtures.

712.0 Testing.

712.1 Media. The piping of the plumbing, drainage, and venting systems shall be tested with water or air. The Authority Having Jurisdiction may require the removal of any cleanouts, etc., to ascertain whether the pressure has reached all parts of the system. After the plumbing fixtures have been set and their traps filled with water, they shall be submitted to a final test.

712.2 Water Test. The water test shall be applied to the drainage and vent systems either in its entirety or in sections. If the test is applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged, except the highest opening of the section under test, and each section shall be filled with water, but no section shall be tested with less than a ten (10) foot (3048 mm) head of water. In testing successive sections, at least the upper ten (10) feet (3048 mm) of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost ten (10) feet (3048 mm) of the system) shall have been submitted to a test of less than a ten (10) foot (3048

mm) head of water. The water shall be kept in the system, or in the portion under test, for at least fifteen (15) minutes before inspection starts. The system shall then be tight at all points.

712.3 Air Test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of five (5) pounds per square inch (34.5 kPa) or sufficient to balance a column of mercury ten (10) inches (254 mm) in height. The pressure shall be held without introduction of additional air for a period of at least fifteen (15) minutes.

Part II – Building Sewers.

713.0 Sewer Required.

713.1 Every building in which plumbing fixtures are installed and every premises having drainage piping thereon shall have a connection to a public or private sewer, except as provided in Sections 713.2, and 713.4.

713.2 When no public sewer intended to serve any lot or premises is available in any thoroughfare or right of way abutting such lot or premises, drainage piping from any building or works shall be connected to an approved private sewage disposal system.

713.3 Within the limits prescribed by Section 713.4 hereof, the rearrangement or subdivision into smaller parcels of a lot that abuts and is served by a public sewer shall not be deemed cause to permit the construction of a private sewage disposal system, and all plumbing or drainage systems on any such smaller parcel or parcels shall connect to the public sewer.

713.4 The public sewer may be considered as not being available when such public sewer or any building or any exterior drainage facility connected thereto is located more than two hundred (200) feet (60.8 m) from any proposed building or exterior drainage facility on any lot or premises that abuts and is served by such public sewer.

713.5 No permit shall be issued for the installation, alteration, or repair of any private sewage disposal system, or part thereof, on any lot for which a connection with a public sewer is available.

713.6 On every lot or premises hereafter connected to a public sewer, all plumbing and drainage systems or parts thereof on such lot or premises shall be connected with such public sewer.

Exception: Single-family dwellings and buildings or structures accessory thereto, existing and connected to an approved private sewage disposal system prior to the time of connecting the premises to the public sewer may, when no hazard, nuisance, or insanitary condition is evidenced and written permission has been obtained from the Authority Having Jurisdiction, remain connected to such properly maintained private sewage disposal system when there is insufficient grade or fall to permit drainage to the sewer by gravity.

714.0 Damage to Public Sewer or Private Sewage Disposal System.

714.1 It shall be unlawful for any person to deposit, by any means whatsoever, into any plumbing fixture, floor drain, interceptor, sump, receptor, or device which is connected to any drainage system, public sewer, private sewer, septic tank, or cesspool, any ashes; cinders; solids; rags; flammable, poisonous, or explosive liquids or gases; oils; grease; and any other thing whatsoever that would or could cause damage to the public sewer, private sewer, or private sewage disposal system.

714.2 No rain, surface, or subsurface water shall be connected to or discharged into any drainage system, unless first approved by the Authority Having Jurisdiction.

714.3 No cesspool, septic tank, seepage pit, or drainfield shall be connected to any public sewer or to any building sewer leading to such public sewer.

714.4 The Authority Having Jurisdiction shall review before approval, the installation of a commercial food waste grinder connecting to a private sewage disposal system.

714.5 An approved-type watertight sewage or wastewater holding tank, the contents of which, due to their character, must be periodically removed and disposed of at some approved off-site location, shall be installed only when required by the Authority Having Jurisdiction or the Health Officer to prevent anticipated surface or subsurface contamination or pollution, damage to the public sewer, or other hazardous or nuisance conditions.

715.0 Building Sewer Materials.

715.1 The building sewer, beginning two (2) feet (610 mm) from any building or structure, shall be of such materials as prescribed in this code.

715.2 Joining methods and materials shall be as prescribed in this code.

715.3 Replacement of existing building sewer and building storm sewers using trenchless methodology

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716.0 Markings.

All pipe, brick, block, prefabricated septic tanks, prefabricated septic tank or seepage pit covers, or other parts or appurtenances incidental to the installation of building sewers or private sewage disposal systems shall conform to the approval requirements of Chapter 3 of this code.

717.0 Size of Building Sewers.

The minimum size of any building sewer shall be determined on the basis of the total number of fixture units drained by such sewer, in accordance with Table 7-8. No building sewer shall be smaller than the building drain.

718.0 Grade, Support, and Protection of Building Sewers.

718.1 Building sewers shall be run in practical alignment and at a uniform slope of not less than one-fourth (1/4) of an inch per foot (20.9 mm/m) toward the point of disposal.

> **Exception:** When approved by the Authority Having Jurisdiction and where it is impractical, due to the depth of the street sewer or to the structural features or to the arrangement of any building or structure, to obtain a slope of one-fourth (1/4) of an inch per foot (20.9 mm/m), any such pipe or piping three (3) inches (80 mm) through six (6) inches (150 mm) may have a slope of not less than one-eighth (1/8) inch per foot (10.5 mm/m) and any such piping eight (8) inches (200 mm) and larger may have a slope of not less than one-sixteenth (1/16) of an inch per foot (5.3 mm/m).

718.2 Building sewer piping shall be laid on a firm bed throughout its entire length, and any such piping laid in made or filled-in ground shall be laid on a bed of approved materials and shall be properly supported as required by the Authority Having Jurisdiction.

All nonmetallic yard building sewer piping shall have an electrically conductive tracer wire 18-gauge, iinsulated copper or heavier, green in color, or other approved materials installed in the trench for locating the pipe in the future. The tracer wire shall run the full length of the installed pipe, with one end left above the finished grade at the building end of the pipe, or at a cleanout next to the building wall, and shall be clearly marked. The other end of the tracer wire shall be spliced into the serving utilities tracer wire, when present.

718.3 No building sewer or other drainage piping or part thereof, which is constructed of materials other than those approved for use under or within a building, shall be installed under or within two (2) feet (610 mm) of any building or structure, or part thereof, nor less than one (1) foot (305 mm) below the surface of the ground. The provisions of this subsection include structures such as porches and steps, whether covered or uncovered; breezeways; roofed porte cocheres; roofed patios; carports; covered walks; covered driveways; and similar structures or appurtenances.

719.0 Cleanouts.

719.1 Cleanouts shall be placed inside the building near the connection between the building drain and the building sewer or installed outside the building at the lower end of the building drain and extended to grade.

Additional building sewer cleanouts shall be installed at intervals not to exceed one hundred (100) feet (30,480 mm) in straight runs and for each aggregate horizontal change in direction exceeding one hundred thirty-five (135) degrees (2.36 rad).

719.2 When a building sewer or a branch thereof does not exceed ten (10) feet (3,048 mm) in length and is a straight-line projection from a building drain that is provided with a cleanout, no cleanout will be required at its point of connection to the building drain.

719.3 All required building sewer cleanouts shall be extended to grade and shall comply with all appropriate sections of Cleanouts, Section 707.0, for sizing, construction, and materials. When building sewers are located under buildings, the cleanout requirements of Section 707.0 shall apply.

719.4 Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe.

719.5 Cleanouts installed under concrete or asphalt paving shall be made accessible by yard boxes or by extending flush with paving with approved materials and shall be adequately protected.

719.6 Approved manholes may be installed in lieu of cleanouts, when first approved by the Authority Having Jurisdiction. The maximum distance between manholes shall not exceed three hundred (300) feet (91.4 m).

The inlet and outlet connections shall be made by the use of a flexible compression joint no closer than twelve (12) inches (305 mm) to and not farther than three (3) feet (914 mm) from the manhole. No

flexible compression joints shall be embedded in the manhole base.

720.0 Sewer and Water Pipes.

Building sewers or drainage piping of clay or materials that are not approved for use within a building shall not be run or laid in the same trench as the water pipes unless both of the following requirements are met:

(1) The bottom of the water pipe, at all points, shall be at least twelve (12) inches (305 mm) above the top of the sewer or drain line.

(2) The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least twelve (12) inches (305 mm) from the sewer or drain line.

Water pipes crossing sewer or drainage piping constructed of clay or materials that are not approved for use within a building shall be laid a minimum of twelve (12) inches (305 mm) above that sewer or drain pipe.

Note:

For the purpose of this section, "within the building" shall mean within the fixed limits of the building foundation.

721.0 Location.

721.1 Except as provided in Section 721.2, no building sewer shall be located in any lot other than the lot that is the site of the building or structure served by such sewer nor shall any building sewer be located at any point having less than the minimum distances indicated in Table 7-7.

TABLE 7-7
Minimum Horizontal Distance Required From Building Sewer

Buildings or structures[1]	2 feet	(610 mm)
Property line adjoining private property	Clear[2]	
Water supply wells	50 feet[3]	(15,240 mm)
Streams	50 feet	(15,240 mm)
On-site domestic water service line	1 foot[4]	(305 mm)
Public water main	10 feet[5,6]	(3,048 mm)

Note:

[1] Including porches and steps, whether covered or uncovered; breezeways; roofed portecocheres; roofed patios; carports; covered walks; covered driveways; and similar structures or appurtenances.

[2] See also Section 313.3.

[3] All drainage piping shall clear domestic water supply wells by at least fifty (50) feet (15,240 mm). This distance may be reduced to not less than twenty-five (25) feet (7,620 mm) when the drainage piping is constructed of materials approved for use within a building.

[4] See Section 720.0.

[5] For parallel construction.

[6] For crossings, approval by the Health Department or Authority Having Jurisdiction shall be required.

TABLE 7-8
Maximum/Minimum Fixture Unit Loading on Building Sewer Piping

Size of Pipe, Inches (mm)	Slope, Inches per Foot (mm/m) 1/16 (5.3)	1/8 (10.5)	1/4 (20.9)
6 and smaller (150)	(As specified in Table 7-5/No minimum loading)		
8 (200)	1,950/1,500	2,800/625	3,900/275
10 (250)	3,400/1,600	4,900/675	6,800/300
12 (300)	5,600/1,700	8,000/725	11,200/325

721.2 Nothing contained in this code shall be construed to prohibit the use of all or part of an abutting lot to:

(1) Provide access to connect a building sewer to an available public sewer when proper cause and legal easement, not in violation of other requirements, has been first established to the satisfaction of the Authority Having Jurisdiction.

(2) Provide additional space for a building sewer when proper cause, transfer of ownership, or change of boundary, not in violation of other requirements, has been first established to the satisfaction of the Authority Having Jurisdiction. The instrument recording such action shall constitute an agreement with the Authority Having Jurisdiction and shall clearly state and show that the areas so joined or used shall be maintained as a unit during the time they are so used. Such an agreement shall be recorded in the office of the County Recorder as part of the conditions of ownership of said properties, and shall be binding on all heirs, successors, and assigns to such properties. A copy of the instrument recording such proceedings shall be filed with the Authority Having Jurisdiction.

722.0 Abandoned Sewers and Sewage Disposal Facilities.

722.1 Every abandoned building (house) sewer, or part thereof, shall be plugged or capped in an approved manner within five (5) feet (1,524 mm) of the property line.

722.2 Every cesspool, septic tank, and seepage pit that has been abandoned or has been discontinued otherwise from further use, or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed therefrom and be completely filled with earth, sand, gravel, concrete, or other approved material.

722.3 The top cover or arch over the cesspool, septic tank, or seepage pit shall be removed before filling, and the filling shall not extend above the top of the vertical portions of the sidewalls or above the level of any outlet pipe until inspection has been called and the cesspool, septic tank, or seepage pit has been inspected. After such inspection, the cesspool, septic tank, or seepage pit shall be filled to the level of the top of the ground.

722.4 No person owning or controlling any cesspool, septic tank, or seepage pit on the premises of such person or in that portion of any public street, alley, or other public property abutting such premises, shall fail, refuse, or neglect to comply with the provisions of this section or upon receipt of notice so to comply from the Authority Having Jurisdiction.

722.5 Where disposal facilities are abandoned consequent to connecting any premises with the public sewer, the permittee making the connection shall fill all abandoned facilities as required by the Authority Having Jurisdiction within thirty (30) days from the time of connecting to the public sewer.

723.0 Building Sewer Test.

Building sewers shall be tested by plugging the end of the building sewer at its points of connection with the public sewer or private sewage disposal system and completely filling the building sewer with water from the lowest to the highest point thereof, or by approved equivalent low-pressure air test. The building sewer shall be watertight at all points.