CHAPTER 30

SANITARY DRAINAGE

SECTION P3001
GENERAL

P3001.1 Scope. The provisions of this chapter shall govern the materials, design, construction and installation of sanitary drainage systems. Plumbing materials shall conform to the requirements of this chapter. The drainage waste and vent (DWV) system shall consist of all piping for conveying wastes from plumbing fixtures, appliances and appurtenances, including fixture traps; above-grade drainage piping; below-grade drains within the building (building drain); below- and above-grade venting systems; and piping to the public sewer or private septic system.

P3001.2 Protection from freezing. No portion of the above-grade DWV system other than vent terminals shall be located outside of a building, in attics or crawl spaces, concealed in outside walls, or in any other place subjected to freezing temperatures unless adequate provision is made to protect them from freezing by insulation or heat or both, except in localities having a winter design temperature above 32°F (0°C) (ASHRAE 97.5 percent column, winter, see Chapter 3).

P3001.3 Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1), drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

SECTION P3002
MATERIALS

P3002.1 Piping within buildings. Drain, waste and vent (DWV) piping in buildings shall be as shown in Table P3002.1 except that galvanized wrought-iron or galvanized steel pipe shall not be used underground and shall be maintained not less than 6 inches (152 mm) above ground. Allowance shall be made for the thermal expansion and contraction on plastic piping.

P3002.2 Building sewer. Building sewer piping shall be as shown in Table P3002.2. Forced main sewer piping shall conform to one of the standards for ABS plastic pipe, cast-iron pipe, copper or copper-alloy tubing, PVC plastic pipe, or pressure-rated pipe listed in Table P3002.2.

P3002.3 Fittings. Fittings shall be approved and compatible with the type of piping being used and shall be of a sanitary or DWV design for drainage and venting. Waterpipe fittings shall be permitted for use in engineer designed systems where the design indicates compliance with Section P3101.2.1.

P3002.3.1 Drainage. Drainage fittings shall have a smooth interior waterway of the same diameter as the piping served. All fittings shall conform to the type of pipe used. Drainage fittings shall have no ledges, shoulders or reductions which can retard or obstruct drainage flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type, black or galvanized. Drainage fittings shall be designed to maintain one-fourth unit vertical in 12 units horizontal (2-percent slope) grade.

P3002.4 Other materials. Sheet lead, lead bends, lead traps and sheet copper shall comply with Sections P3002.4.1 through P3002.4.3.

P3002.4.1 Sheet lead. Sheet lead for the following uses shall weigh not less than indicated below:

1. Flashing of vent terminals, 3 psf (0.144 kN/m^2).
2. Prefabricated flashing for vent pipes, $2^1/_2$ psf (0.120 kN/m^2).

P3002.4.2 Lead bends and traps. Lead bends and lead traps shall not be less than 0.125-inch (3.2 mm) wall thickness.

P3002.4.3 Sheet copper. Sheet copper for the following uses shall weigh not less than indicated below:

1. General use, 12 ounces per square feet (3.82 L/m^2).
2. Flashing for vent pipes, 8 ounces per square feet (2.55 L/m^2).

SECTION P3003
JOINTS AND CONNECTIONS

P3003.1 Tightness. Joints and connections in the DWV system shall be gas tight and water tight for the intended use or pressure required by test.

P3003.2 Prohibited joints. Running threads and bands shall not be used in the drainage system. Drainage and vent piping shall not be drilled, tapped, burned or welded.

The following types of joints and connections shall be prohibited:

1. Cement or concrete.
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.

P3003.3 Joint requirements, similar piping materials. Joints between similar piping materials shall be made in accordance with Sections P3003.3.1 through P3003.3.7.

P3003.3.1 Cast-iron pipe, caulked joints. Lead-caulked joints for cast-iron hub and spigot soil pipe shall be firmly packed with oakum and filled with molten lead not less than

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1 inch (25.4 mm) deep and shall not extend more than 0.125 inch (3.2 mm) below the rim of the hub. Lead shall be poured in one operation and shall be caulked tight.

P3003.3.2 Cast-iron pipe, mechanical joints. Mechanical joints used with cast-iron pipe shall comply with Section P3003.3.2.1 or P3003.3.2.2.

P3003.3.2.1 Hubless pipe. Joints for hubless cast-iron soil pipe shall be made with an approved elastomeric sealing sleeve and stainless steel-retaining sleeve.

P3003.3.2.2 Hub and spigot joints. An approved positive-seal one-piece elastomeric compression-type gasket that is placed in the hub before the spigot is inserted shall be permitted to be used for joining hub and spigot cast-iron soil piping and fittings as an alternate for lead and oakum joints.

P3003.3.3 Threaded pipe joints. Threaded joints shall conform to American National Taper Pipe Thread. Pipe ends shall be reamed or filed to size and all chips removed. Pipe-joint compound or tape shall be applied on the male threads only.

P3003.3.4 Soldered joints. Soldered joints in tubing shall be made with fittings approved for DWV piping. Surfaces to be soldered shall be cleaned bright. The joints shall be properly fluxed and made with approved solder. Fluxes shall conform to ASTM B 813. The joint shall be soldered with a solder conforming to ASTM B 32.

TABLE P3002.1
DRAIN, WASTE AND VENT PIPING AND FITTING MATERIALS

MATERIAL	STANDARD
Welded and seamless steel pipe (black or galvanized)	ASTM A 53
Cast-iron soil pipe and fittings (hub and spigot)	ASTM A 74
Cast-iron fittings (threaded)	ASTM A 126
Malleable iron fittings (threaded)	ASTM A 197
Seamless copper pipe, standard sizes	ASTM B 42
Seamless red brass pipe, standard sizes	ASTM B 43
Seamless copper tube	ASTM B 75
Seamless copper water tube Type K, L and M	ASTM B 88
ABS-DWV pipe and fittings	ASTM D 2661
PVC-DWV pipe and fittings	ASTM D 2665
3.25-inch O.D. PVC-DWV pipe and fittings	ASTM D 2949
ABS-DWV sch.40 pipe with cellular core	ASTM F 628
Co-extruded PVC plastic pipe with cellular core	ASTM F 891
Co-extended composite ABS DWV pipe and fittings	ASTM F 1488
Cast-iron soil pipe and fittings (hubless)	CISPI 301
Copper drainage tube (DWV)	ASTM B 306
Mechanical couplings for drain, waste and vent pipe and sewer pipe	ASTM C1460; ASTM C 1461; CSA CAN/CSA B602
Solvent cement for ABS-DWV pipe and fittings	ASTM D 2235
Solvent cement for PVC-DWV pipe and fittings	ASTM D 2564
Socket cell for PVC-DWV pipe and fittings	ASTM D 2672
Primers for solvent cemented PVC-DWV pipe and fittings	ASTM F 656
Hubless cast-iron soil pipe and fittings	ASTM A 888
Couplings for use in connection with hubless cast-iron soil pipe and fittings	ASTM C1460; ASTM C1461; CISPI 310
Shielded couplings joining hubless cast-iron soil pipe and fittings	ASTM C 1277; ASTM C1460; ASTM C1461
Co-extruded composite ABS DWV schedule 40 IPS pipe (solid or cellular core) solvent cement fittings	ASTM F 1488; ASTM D 2235; ASTM D 2661; ASTM F 628
Co-extruded composite PVC DWV schedule 40 IPS pipe (solid or cellular core) solvent cement fittings	ASTM F 1488; ASTM D 2564; ASTM D 2665; ASTM F 891
Co-extruded composite PVC DWV IPS pipe-DR-PS140 or PS200 solvent cement fittings	ASTM F 1488; ASTM D 2564; ASTM D 2665; ASTM F 891

For SI: 1 inch = 25.4 mm.

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TABLE P3002.2
BUILDING SEWER PIPING

MATERIAL	STANDARD
Cast-iron pipe and fittings	ASTM A 74
Cast-iron soil pipe and fittings for hubless sanitary system	CISPI 301
Seamless copper tube	ASTM B 75
Copper water tube	ASTM B 88
Concrete sewer, storm drain and culvert pipe	ASTM C 14
Compression joints for vitrified clay pipe and fittings	ASTM C 425
Vitrified clay pipe and fittings	ASTM C 700
Bitumenized fiber drain and sewer pipe	ASTM D 1861
ABS-DWV pipe and fittings	ASTM D 2661
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F 714
PVC/DWV pipe and fittings	ASTM D 2665
ABS Sewer pipe and fittings	ASTM D 2751
3.25-inch O.D. PVC/DWV pipe and fittings	ASTM D 2949
Type PSM/PVC sewer pipe and fittings	ASTM D 3034
Joints for drain and sewer plastic pipe using flexible elastomeric seals	ASTM D 3212
ABS Schedule 40 DWV pipe with cellular core	ASTM F 628
Co-extruded PVC schedule 40, PS 50 or PS 100 plastic pipe with cellular core	ASTM F 891
Copper drainage tube (DWV)	ASTM B 306
Mechanical couplings for drain waste and vent pipe and sewer pipe	ASTM C 1460; ASTM C 1461; CSA CAN/CSA B602
Solvent cement for ABS-DWV pipe and fittings	ASTM D 2235
Solvent cement for PVC-DWV pipe and fittings	ASTM D 2564
Socket bell for PVC-DWV pipe and fittings	ASTM D 2672
Primers for solvent cemented PVC-DWV pipe and fittings	ASTM F 656
Couplings for hubless cast-iron soil pipe and fittings	ASTM C 1460; ASTM C 1461; CISPI 310
Shielded couplings joining cast-iron soil pipe and fittings	ASTM C 1277; ASTM C 1460; ASTM C 1461
Cast-iron soil pipe and fittings for hubless sanitary system	ASTM A 888
Co-extruded composite ABS/DWV schedule 40 IPS pipe (solid or cellular core) solvent cement fittings	ASTM F 1488; ASTM D 2235; ASTM D 2661; ASTM F 628
Co-extruded composite PVC DWV schedule 40 IPS pipe (solid or cellular core) solvent cement fittings	ASTM F 1488; ASTM D 2564; ASTM D 2665; ASTM F 891
Co-extruded composite PVC DWV IPS-DR-PS in PS35, PS50, PS100, PS140, PS 200 solvent cement fittings	ASTM F 1488; ASTM D 2564; ASTM D 2665; ASTM F 891
Co-extruded composite ABS sewer and drain pipe DR-PS in PS35, PS50, PS100, PS140, PS200 solvent cement fittings	ASTM F 1488; ASTM D 2235; ASTM D 2751
Co-extruded composite PVC sewer and drain pipe DR-PS in PS35, PS50, PS100, PS140, PS200 solvent cement fittings	ASTM F 1488; ASTM D 2564; ASTM D 3034; ASTM F 789

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P3003.3.5 Clay or cement soil pipe joints. Joints between concrete pipe or fittings shall be made with an elastomeric seal conforming to ASTM C 443, ASTM C 1173, CSA CAN/CSA A257.3 or CSA CAN/CSA-B602. Joints between vitrified clay pipe or fittings shall be made with an elastomeric seal conforming to ASTM C 425, ASTM C 1173 or CSA CAN/CSA-B602.

P3003.3.6 Plastic pipe joints. Joints in plastic piping shall be made with approved fittings by solvent cementing, elastomeric gaskets or other approved manufactured system.

P3003.3.7 Slip joints. Slip joints shall be made using approved gaskets or compression washers. Ground joint connections that allow adjustment of tubing but provide a rigid

joint when made up shall not be considered slip joints. When a ground joint connection is used and the assembled joint does not permit free movement, the joint need not be accessible.

P3003.4 Joints between different piping materials. Joints between different piping material shall comply with Sections P3003.4.1 through P3003.4.5.

P3003.4.1 Hub-type cast-iron or vitrified clay to other piping materials. Joints between hub-type drainage piping and other materials, including steel, plastic and copper may be made with a lead and oakum joint and an approved caulking ferrule of the other material or by a lead and oakum joint directly with the other material omitting the adapter ferrule. Where the outside diameter of the other material matches that of the hub pipe, an elastomeric gasket designed for use with the hub pipe may be used.

P3003.4.2 Hubless pipe to other piping materials. Joints between hubless drainage piping and any other materials shall be joined with an approved elastomeric sleeve and stainless steel clamp.

P3003.4.3 Threaded pipe to cast-iron soil pipe. Joints between threaded pipe and cast-iron soil pipe shall be made with approved adapter fittings.

P3003.4.4 Threaded pipe to copper or plastic pipe. Joints from threaded pipe to copper or plastic piping shall utilize approved adapter fittings.

P3003.4.5 Joints between drainage piping and water closets. Joints between drainage piping and water closets or similar fixtures shall be made by means of a closet flange compatible with the drainage system material securely fastened to a structurally firm base. The inside diameter of the drainage pipe shall not be used as a socket fitting for a four by three closet flange. The joint shall be sealed, with an approved gasket, flange to fixture connection complying with ASME A112.4.3 or setting compound between the fixture and the closet flange.

SECTION P3004
DETERMINING DRAINAGE FIXTURE UNITS

P3004.1 DWV system load. The load on DWV-system piping shall be computed in terms of drainage fixture unit (d.f.u.) values in accordance with Table P3004.1.

SECTION P3005
DRAINAGE SYSTEM

P3005.1 Drainage fittings and connections. Changes in direction in drainage piping shall be made by the appropriate use of sanitary tees, wyes, sweeps, bends or by a combination of these drainage fittings in accordance with Table P3005.1. Change in direction by combination fittings, heel or side inlets or increasers shall be installed in accordance with Table P3005.1 and Sections P3005.1.1 through P3005.1.4. based on the pattern of flow created by the fitting.

TABLE P3005.1
FITTINGS FOR CHANGE IN DIRECTION

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

For SI: 1 inch = 25.4 mm.

a. The fitting shall only be permitted for a 2-inch or smaller fixture drain.

b. Three inches and larger.

c. For limitation on multiple connection fittings, see Section P3005.1.1.

P3005.1.1 Horizontal to vertical (multiple connection fittings). Double fittings such as double sanitary tees and teewyes or approved multiple connection fittings and back-to-back fixture arrangements that connect two or more branches at the same level shall be permitted as long as directly opposing connections are the same size and the discharge into directly opposing connections is from similar fixture types or fixture groups. 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 tee patterns shall be permitted where the horizontal developed length between the outlet of the water closet and the connection to the double sanitary tee is 18 inches (457 mm) or greater.

P3005.1.2 Heel- or side-inlet quarter bends, drainage. Heel-inlet quarter bends shall be an acceptable means of connection, except where the quarter bends 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 both drainage, wet venting and stack venting arrangements.

P3005.1.3 Heel- or side-inlet quarter bends, venting. Heel-inlet or side-inlet quarter bends, or any arrangement of pipe and fittings producing a similar effect, shall be acceptable as a dry vent where the inlet is placed in a vertical position. The inlet is permitted to be placed in a horizontal position only where the entire fitting is part of a dry vent arrangement.

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TABLE P3004.1
DRAINAGE FIXTURE UNIT (d.f.u.) VALUES FOR VARIOUS PLUMBING FIXTURES

TYPE OF FIXTURE OR GROUP OF FIXTURES	DRAINAGE FIXTURE UNIT VALUE (d.f.u.)[a]
Bar sink	1
Bathtub (with or without shower head and/or whirlpool attachments)	2
Bidet	1
Clothes washer standpipe	2
Dishwasher	2
Floor drain[b]	0
Kitchen sink	2
Lavatory	1
Laundry tub	2
Shower stall	2
Water closet (1.6 gallons per flush)	3
Water closet (greater than 1.6 gallons per flush)	4
Full-bath group with bathtub (with 1.6 gallon per flush water closet, and with or without shower head and/or whirlpool attachment on the bathtub or shower stall)	5
Full-bath group with bathtub (water closet greater than 1.6 gallon per flush, and with or without shower head and/or whirlpool attachment on the bathtub or shower stall)	6
Half-bath group (1.6 gallon per flush water closet plus lavatory)	4
Half-bath group (water closet greater than 1.6 gallon per flush plus lavatory)	5
Kitchen group (dishwasher and sink with or without garbage grinder)	2
Laundry group (clothes washer standpipe and laundry tub)	3
Multiple-bath groups[c]: 1.5 baths 2 baths 2.5 baths 3 baths 3.5 baths	 7 8 9 10 11

For SI: 1 gallon = 3.785 L.

a. For a continuous or semicontinuous flow into a drainage system, such as from a pump or similar device, 1.5 fixture units shall be allowed per gpm of flow. For a fixture not listed, use the highest d.f.u. value for a similar listed fixture.

b. A floor drain itself adds no hydraulic load. However, where used as a receptor, the fixture unit value of the fixture discharging into the receptor shall be applicable.

c. Add 2 d.f.u. for each additional full bath.

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P3005.1.4 Water closet connection between flange and pipe. One-quarter bends 3 inches (76 mm) in diameter shall be acceptable for water closet or similar connections, provided a 4-inch-by-3-inch (102 mm by 76 mm) flange is installed to receive the closet fixture horn. Alternately, a 4-inch-by-3-inch (102 mm by 76 mm) elbow shall be acceptable with a 4-inch (102 mm) flange.

P3005.1.5 Dead ends. Dead ends shall be prohibited except where necessary to extend a cleanout or as an approved part of a rough-in more than 2 feet (610 mm) in length.

P3005.1.6 Provisions for future fixtures. Where drainage has been roughed-in for future fixtures, the drainage unit values of the future fixtures shall be considered in determining the required drain sizes. Such future installations shall be terminated with an accessible permanent plug or cap fitting.

P3005.1.7 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.

P3005.2 Drainage pipe cleanouts. Drainage pipe cleanouts shall comply with Sections P3005.2.1 through P3005.2.11.

Exception: These provisions shall not apply to pressurized building drains and building sewers that convey the discharge of automatic pumping equipment to a gravity drainage system.

P3005.2.1 Materials. Cleanouts shall be liquid and gas tight. Cleanout plugs shall be brass or plastic.

P3005.2.2 Spacing. Cleanouts shall be installed not more than 100 feet (30 480 mm) apart in horizontal drainage lines.

P3005.2.3 Underground drainage cleanouts. When installed in underground drains, cleanouts shall be extended vertically to or above finished grade either inside or outside the building.

P3005.2.4 Change of direction. Cleanouts shall be installed at each change of direction of the drainage system greater than 45 degrees, except not more than one cleanout shall be required in each 40 feet (12 192 mm) of run regardless of change in direction.

P3005.2.5 Accessibility. Cleanouts shall be accessible. Minimum clearance in front of cleanouts shall be 18 inches on 3 inches (457 mm on 76 mm) and larger pipes, and 12 inches (305 mm) on smaller pipes. Concealed cleanouts shall be provided with access of sufficient size to permit removal of the cleanout plug and rodding of the system. Cleanout plugs shall not be concealed by permanent finishing material.

P3005.2.6 Base of stacks. Accessible cleanouts shall be provided near the base of each vertical waste or soil stack. Alternatively, such cleanouts may be installed outside the building within 3 feet (914 mm) of the building wall.

P3005.2.7 Building drain and building sewer junction. There shall be a cleanout near the junction of the building drain and building sewer. This cleanout may be either inside or outside the building wall, provided it is brought up to finish grade or to the lowest floor level. An accessible interior building drain cleanout or test tee within close proximity to the building drain exit point shall fulfill this requirement.

P3005.2.8 Direction of flow. Cleanouts shall be installed so that the cleanout opens to allow cleaning in the direction of the flow of the drainage line.

P3005.2.9 Cleanout size. Cleanouts shall be sized in accordance with Table P3005.2.9.

Exception: Cast-iron cleanout sizing shall be in accordance with referenced standards in Table P3002.1, ASTM A 74 for hub and spigot fittings or ASTM A 888 or CISPI 301 for hubless fittings.

TABLE P3005.2.9
CLEANOUTS

PIPE SIZE (inches)	CLEANOUT SIZE (inches)
$1^1/_2$	$1^1/_2$
2	2
3	$2^1/_2$
4 and larger	$3^1/_2$

For SI: 1 inch = 25.4 mm.

P3005.2.10 Cleanout equivalent. A fixture trap or a fixture with integral trap, readily removable without disturbing concealed piping shall be acceptable as a cleanout equivalent.

P3005.2.11 Connections to cleanouts prohibited. Cleanout openings shall not be used for the installation of new fixtures except where approved and an acceptable alternate cleanout is provided.

P3005.3 Horizontal drainage piping slope. Horizontal drainage piping shall be installed in uniform alignment at uniform slopes not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for $2^1/_2$-inch (64 mm) diameter and less, and not less than one-eighth unit vertical in 12 units horizontal (1-percent slope) for diameters of 3 inches (76 mm) or more.

P3005.4 Drain pipe sizing. Drain pipes shall be sized according to drainage fixture unit (d.f.u.) loads. The size of the drainage piping shall not be reduced in size in the direction of flow. The following general procedure is permitted to be used:

1. Draw an isometric layout or riser diagram denoting fixtures on the layout.
2. Assign d.f.u. values to each fixture group plus individual fixtures using Table P3004.1.
3. Starting with the top floor or most remote fixtures, work downstream toward the building drain, accumulating d.f.u. values for fixture groups plus individual fixtures for each branch. Where multiple bath groups are being added, use the reduced d.f.u. values in Table P3004.1, which take into account probability factors of simultaneous use.
4. Size branches and stacks by equating the assigned d.f.u. values to pipe sizes shown in Table P3005.4.1.
5. Determine the pipe diameter and slope of the building drain and building sewer based on the accumulated d.f.u. values, using Table P3005.4.2.

P3005.4.1 Fixture branch and stack sizing.

1. Branches and stacks shall be sized according to Table P3005.4.1. Below grade drain pipes shall not be less than $1^1/_2$ inches (38 mm) in diameter.
2. Minimum stack size. Drain stacks shall not be smaller than the largest horizontal branch connected, with the following exceptions:
   2.1. A 4-inch by 3-inch (102 mm by 76 mm) closet bend or flange or a 4-inch (102 mm) closet bend into a 3-inch (76 mm) stack tee shall be acceptable (see Section P3005.1.4).

TABLE P3005.4.1
MAXIMUM FIXTURE UNITS ALLOWED TO BE CONNECTED TO BRANCHES AND STACKS

NOMINAL PIPE SIZE (inches)	ANY HORIZONTAL FIXTURE BRANCH	ANY ONE VERTICAL STACK OR DRAIN
$1^1/_4$[a]	—	—
$1^1/_2$[b]	3	4
2[b]	6	10
$2^1/_2$[b]	12	20
3	20	48
4	160	240

For SI: 1 inch = 25.4 mm.

a. $1^1/_4$-inch pipe size limited to a single-fixture drain or trap arm. See Table P3201.7.

b. No water closets.

P3005.4.2 Building drain and sewer size and slope. Pipe sizes and slope shall be determined from Table P3005.4.2 on the basis of drainage load in fixture units (d.f.u.) computed from Table P3004.1.

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TABLE P3005.4.2
MAXIMUM NUMBER OF FIXTURE UNITS ALLOWED TO BE CONNECTED TO THE BUILDING DRAIN, BUILDING DRAIN BRANCHES OR THE BUILDING SEWER

DIAMETER OF PIPE (inches)	SLOPE PER FOOT		
	1/8 inch	1/4 inch	1/2 inch
1 1/2 [a,b]	—	Note a	Note a
2 [b]	—	21	27
2 1/2 [b]	—	24	31
3	36	42	50
4	180	216	250

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

a. 1 1/2-inch pipe size limited to a building drain branch serving not more than two waste fixtures, or not more than one waste fixture if serving a pumped discharge fixture or garbage grinder discharge.

b. No water closets.

SECTION P3006
SIZING OF DRAIN PIPE OFFSETS

P3006.1 Vertical offsets. An offset in a vertical drain, with a change of direction of 45 degrees (0.79 rad) or less from the vertical, shall be sized as a straight vertical drain.

P3006.2 Horizontal offsets above the lowest branch. A stack with an offset of more than 45 degrees (0.79 rad) from the vertical shall be sized as follows:

1. The portion of the stack above the offset shall be sized as for a regular stack based on the total number of fixture units above the offset.
2. The offset shall be sized as for a building drain in accordance with Table P3005.4.2.
3. The portion of the stack below the offset shall be sized as for the offset or based on the total number of fixture units on the entire stack, whichever is larger.

P3006.3 Horizontal offsets below the lowest branch. In soil or waste stacks below the lowest horizontal branch, there shall be no change in diameter required if the offset is made at an angle not greater than 45 degrees (0.79 rad) from the vertical. If an offset greater than 45 degrees (0.79 rad) from the vertical is made, the offset and stack below it shall be sized as a building drain (see Table P3005.4.2).

SECTION P3007
SUMPS AND EJECTORS

P3007.1 Sewage ejectors or sewage pumps. A sewage ejector, sewage pump, or grinder pump receiving discharge from a water closet shall have minimum discharge velocity of 1.9 feet per second (0.579 m/s) throughout the discharge piping to the point of connection with a gravity building drain, gravity sewer or pressure sewer system. A nongrinding pump or ejector shall be capable of passing a 1.5-inch-diameter (38 mm) solid ball, and the discharge piping shall be not less than 2 inches (51 mm) in diameter. The discharge piping of grinding pumps shall be not less than 1.25 inches (32 mm) in diameter. A check valve and a gate 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 drainage system. Access shall be provided to such valves. Such valves shall be located above the sump cover or, when 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 removeable access cover.

Exception: Macerating toilet systems shall be permitted to have the discharge pipe sized in accordance with manufacturer's instructions, but not less than 0.75 inch (19.1 mm) in diameter.

P3007.2 Building drains below sewer (building subdrains). Building drains which cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the contents shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment.

P3007.3 Drainage piping. The system of drainage piping below the sewer level shall be installed and vented in a manner similar to that of the gravity system. Only such drains that must be lifted for discharge shall be discharged into sumps. All other drains shall be discharged by gravity.

Exception: Macerating toilet systems shall be permitted as an alternate to the sewage pump or ejector system. The macerating toilet shall comply with ASME A112.3.4 or CSA B45.9 and shall be installed in accordance with the manufacturers' instructions.

SECTION P3008
BACKWATER VALVES

P3008.1 General. Fixtures that have flood level rims located below the elevation of the next upstream manhole cover of the public sewer serving such fixtures shall be protected from backflow of sewage by installing an approved backwater valve. Fixtures having flood level rims above the elevation of the next upstream manhole shall not discharge through the backwater valve. Backwater valves shall be provided with access.

P3008.2 Construction. Backwater valves shall have noncorrosive bearings, seats and self-aligning discs, and shall be constructed to ensure a positive mechanical seal. Valve access covers shall be water tight.

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