

CHAPTER 3 GENERAL REGULATIONS

301 GENERAL

301.1 Scope

The provisions of this chapter shall govern the general regulations not specific to other chapters.

301.2 Basic Principles

The basic principles of this code are enunciated as basic goals in environmental sanitation worthy of accomplishment through properly designed, acceptably installed and adequately maintained plumbing systems. Some of the details of plumbing construction must vary, but the basic sanitary and safety principles are the same. The principles may serve to define the intent.

301.2.1 Principle Number 1 (moved from 601.2)

Buildings, structures and premises intended for human habitation, occupancy, use of employment, or the preparation or processing of food, drinks or other materials for human consumption shall be provided with an adequate, safe and potable water supply through a safe system of piping to all fixtures, appliances, appurtenances, etc.

301.2.2 Principle Number 2 (moved from 701.2)

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.

301.2.3 Principle Number 3 (moved from 401.2)

A dwelling type building provided with a drainage system, a public sewer connection or a private sewage disposal system shall have at least one (1) water closet, one (1) bathtub or shower, one (1) lavatory, one (1) kitchen-type sink and an adequate source of hot water for each family unit to meet minimum basic requirements for health, sanitation and personal hygiene. Water heating facilities shall be accessible for emergency maintenance without entering any individual apartment or living unit, except that water heaters may be located within an apartment or living unit when supplying hot water to that unit only. All other buildings, structures or premises intended for human occupancy or use shall be provided with adequate sanitary facilities as may be required, but not less than one (1) water closet and one (1) lavatory.

301.2.4 Principle Number 4 (moved from 401.3)

Plumbing fixtures shall be made of smooth nonabsorbent material, shall be free from concealed fouling surfaces, and shall be located in ventilated enclosures.

301.2.5 Principle Number 5 (moved from 401.4)

Each fixture directly connected to the sanitary drainage system shall be equipped with a water-seal trap.

301.2.6 Principle Number 6 (moved from 301.3)

No substance which will clog the pipes, produce explosive mixtures, destroy the pipes or their joints or interfere unduly with the sewage-disposal process shall be allowed to enter the building drainage system.

301.2.7 Principle Number 7 (moved from 801.2)

Proper protection shall be provided to prevent contamination of food, water, sterile goods and similar materials by backflow of sewage. When necessary, the fixture, device or appliance shall be connected indirectly with the building drainage system.

301.2.8 Principle Number 8

No water closet shall be located in a room or compartment which is not properly lighted and ventilated.

301.2.9 Principle Number 9 (moved from 701.3)

If water closets or other plumbing fixtures are installed in buildings where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the building sewage by some accepted method of sewage treatment and disposal.

301.2.10 Principle Number 10 (moved from 701.4)

Where a plumbing drainage system may be subject to backflow of sewage, suitable provisions shall be made to prevent its overflow in the building.

301.2.11 Principle Number 11 (moved from 301.2)

Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixture usage.

301.2.12 Principle Number 12 (moved from 701.5)

Sewage or other waste, from a plumbing system, which may be deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to some acceptable form of treatment.

301.2.13 Principle Number 13 (moved from 601.3)

Plumbing fixtures, devices, appliances and appurtenances shall be adequately supplied with water in sufficient volume and pressure to enable them to function properly.

301.2.14 Principle Number 14 (moved from 601.4)

The pipes conveying water to plumbing fixtures, appliances, devices and appurtenances shall be of sufficient size as to supply water at rates that will prevent undue pressure drops at any one fixture, when any other fixture, appliance, device or appurtenance or group is being flushed, operated or used.

301.2.15 Principle Number 15 (moved from 601.5)

There shall be no direct or indirect cross connections, either existing or potential, between a safe potable water supply and an unsafe, nonpotable supply.

301.2.16 Principle Number 16 (moved from 601.6)

Adequate protection shall be provided to prevent possible backflow or back-siphonage of an unsafe or potentially hazardous fluid or material into a safe water supply.

301.2.17 Principle Number 17 (moved from 601.7)

Piping and connections of the plumbing system shall be of durable materials, free from defects in workmanship and materials, and systems shall be designed and constructed to provide adequate service for a reasonable life under stresses imposed by structural loading, temperature variation, vibration and other conditions.

301.2.18 Principle Number 18 (moved from 501.2)

Devices for heating and storing water shall be designed and installed to prevent all danger from overheating and explosion and to prevent undue flow of hot water or steam into the cold water supply pipes.

301.2.19 Principle Number 19 (moved from 801.3)

Refrigerators, coolers, receptacles, sterilizers, vats and similar equipment used for storing or holding foods, beverages, sterile goods and water conditioning equipment, etc., shall discharge into the building drainage system through an indirect waste.

301.2.20 Principle Number 20 (moved from 404.3)

Water closets, bathtubs, showers, urinals and similar fixtures shall be suitably enclosed and screened for privacy.

301.2.21 Principle Number 21 (moved from 301.4)

Plumbing systems, including fixtures, shall be maintained in sanitary condition and proper working order.

301.2.22 Principle Number 22 (moved from 701.3)

Sewage and wastes from plumbing and drainage systems shall be adequately treated and disposed of in accordance with the requirements of the plumbing official.

301.5 Repairs and Alterations

301.5.1 Existing Buildings. In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, necessary deviations from the provisions of this code may be permitted, provided such deviations conform to the intent of the code and are approved in writing by the plumbing official.

301.5.2 Health or Safety. Wherever compliance with all the provisions of this code fails to eliminate or alleviate a nuisance which may involve health or safety hazards, the owner or his agent shall install such additional plumbing or drainage equipment as may be necessary to abate such nuisance.

301.6 Workmanship

Workmanship shall conform to generally accepted good practice.

301.7 Rodent-Proofing

301.7.1 Exterior Openings. All exterior openings provided for the passage of piping shall be properly sealed with snugly fitting collars of metal or other approved rodent-proof material securely fastened into place.

301.7.2 Interior Openings. Interior openings through walls, floors, and ceilings shall be rodent-proofed as found necessary by the plumbing official.

301.8 Used Equipment

It shall be unlawful to install used equipment or material for plumbing installations unless it complies with the minimum standards set forth in this code and is approved by the plumbing official.

301.9 Condemned Equipment

Any plumbing equipment condemned by the plumbing official because of wear, damage, defects, or sanitary hazards shall not be reused for plumbing purposes.

301.10 Drainage Below Sewer Level

Drainage piping located below the level of the sewer shall be installed in accordance with Chapter 7.

301.11 Connections to Plumbing System

301.11.1 Connections to Drainage System. All plumbing fixtures, drains, appurtenances and appliances used to receive or discharge liquid wastes or sewage shall be directly connected properly to the drainage system of the building or premises, in accordance with the requirements of this code. This section shall not be construed to prevent indirect waste systems provided for in Chapter 8.

301.11.2 Connections to Water Supply. Every plumbing fixture or device or appliance requiring or using water for its proper operation shall be directly or indirectly connected to the water supply system in accordance with the provisions of this code.

302 DEFINITIONS

The following definitions have been moved to Chapter 2: ANCHORS, HANGARS, LEAD FREE PIPE AND FITTINGS, LEAD FREE SOLDER AND FLUX.

303 MATERIALS

303.1 Minimum Standards

Materials listed in this section are applicable to more than one chapter. Material requirements for specific systems and fixtures are noted in the specific chapters. Materials listed in this code shall conform at least to the standards cited when used in the construction, installation, alteration, or repair of any part of a plumbing and drainage system, except that the

plumbing official shall allow the extension, addition, or relocation of existing soil, waste or vent pipes with materials of like grade, as permitted by this code.

303.2 Use of Materials

Where more than one standard is listed, the material shall conform to at least one of the standards cited opposite it. Its use shall be further governed by the requirements imposed in other chapters of the code. Materials not included in the table shall be used only as provided for in 303.1. Materials shall be free of manufacturing defects or damage, however occasioned, which would, or would tend to, render such materials defective, unsanitary, or otherwise improper to accomplish the purpose of this code.

303.3 Specifications for Materials

Standard specifications for general materials for plumbing installations are listed in Table 303, with specific material specifications listed elsewhere in this code. Products conforming to at least to any one of the specifications listed for a given material shall be considered acceptable.

303.3.1 Abbreviations used in Table 303, and with the specific materials as listed elsewhere in this code refer to standards or specifications as identified below. Addresses are listed in 1403.

- AGA - American Gas Association
- ANSI - American National Standards Institute, Inc.
- ARI - Air-Conditioning & Refrigeration Institute
- ASME - American Society of Mechanical Engineers
- ASSE - American Society of Sanitary Engineering
- ASTM - American Society for Testing Materials
- AWS - American Welding Society
- AWWA - American Water Works Association
- CDA - Copper Development Association, Inc.
- CISPI - Cast Iron Soil Pipe Institute
- CAN/CSA - Canadian Standards Association
- FHA-MPS - Federal Housing Administration - Minimum Property Standards
- FMRC - Factory Mutual Research Corporation
- FS - Federal Specifications obtained from the General Services Administration, Federal Supply Service, Specification Section
- MSS - Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- NFiPA - National Fire Prevention Association
- NSF - NSF International
- NSPI - National Spa and Pool Institute
- PDI - Plumbing and Drainage Institute
- PPFA - Plastic Pipe & Fittings Association
- PPI - Plastics Pipe Institute
- PS - Product Standard by the United States Department of Commerce and obtained from the Superintendent of Documents, Government Printing Office
- UL - Underwriters Laboratories, Inc.

303.3.2 ASTM Standards are issued under fixed designations; the final number shown in Chapter 14 indicates the year of original adoption, or in the case of

revision, the year of last revision. "T" indicates Tentative. In the "CS" series of standards, also, the final number indicates the year of issue.

Table 303
General Materials

MATERIALS	STANDARDS
PLASTIC MATERIALS	
Acetals	ASTM D 2133
Acrylics	ASTM D 788
Fluorocarbon	ASTM D 1457
Nylon	ASTM D 789
PLASTIC CEMENT AND SOLVENTS	
ABS-solvent cement	ASTM D 2235, Listed
Making solvent-cement joints with poly (vinyl chloride) (PVC) pipe and fittings	ASTM D 2855
Primers for use in solvent cemented joints of polyvinyl chloride (PVC) plastic pipe and fittings	ASTM F 656
PVC solvent cement	ASTM D 2564, Listed
Safe handling of solvent cements used for joining thermoplastic pipe and fittings	ASTM F 402
Solvent cements for chlorinated polyvinyl chloride (CPVC) plastic pipe and fittings	ASTM F 493
PLASTIC PIPE INSTALLATION	
Electrofusion joining polyolefin pipe and fittings	ASTM F 1290, See 612.5
Heat joining polyolefin pipe and fittings	ASTM D 2657, See 612.5
Underground installation of flexible thermoplastic sewer pipe	ASTM D 2321
Underground installation of thermoplastic pressure piping	ASTM D 2774
VALVES	
Pressurized fixture flushing devices (flushometers)	ANSI/ASSE 1037
METAL SHEET	
Brass, sheet	ASTM B 248
Copper, sheet	ASTM B 152
Lead, sheet	FS QQ-L-201F(2)
Steel sheet, zinc-coated galvanized by the hot-dip process	ASTM A 653/A 653M

(continued)

**Table 303 (continued)
General Materials**

MATERIALS	STANDARDS
MISCELLANEOUS	
Automatic Flow controllers	ASSE 1028
Brazing filler metal	ASTM B260
Cement lining	ANSI/AWWA C 104/A 21.4
Cleanouls (Metallic)	ASMEA112.36.2M
Coal-Tar Enamel and Tape (Protective Coating)	ANSI/AWWAC203
Compression Gasket, C.I. Soil Pipe	ASTM C 564, CISPI HSN
Couplings used in Cast Iron Systems	ASTM C 564 (Gasket Material Only), CISPI 310, FMRC 1680 ASTM C 1277
Diversers for Plumbing Faucets with Hose Spray, Anti-Siphon Type Residential Application	ANSI/ASSE 1025
Drinking Water Treatment Units Health Effects Aesthetic Effects	ANSI/NSF 53 ANSI/NSF 42
Fixed Flow Restrictors	ASSE 1034
Flexible Transition Couplings for Underground Piping Systems	ASTM C 1173
Floor Drains	ASME A 112.21.1M
Grooved and Shouldered Type Joints	ANSI/AWWA C606
Handheld Showers	ASSE 1014
Laboratory Faucet Vacuum Breaker	ASSE 1035
Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube	ASTM B 813
Making Copper Soldered Joints	ASTM B 828
Oil Resistant Gaskets	ASTM C 443
Plastic Toilet (Water Closet) Seats	ANSI Z124.5
P.V.C. Transition Fittings, Testing	ASTM D 395, ASTM D 412, See 707.4
Reverse Osmosis Drinking Water Treatment Systems	ANSI/NSF 58
Roof Drains	ASME A112.21.2M
Rubber Rings for Asbestos Cement Pipe	ASTM D 1869, See 308.5
Solder Metal	ASTM B 32
Supports for Off-the-Floor Plumbing Fixtures for Public Use	ANSI A112.6.1M
Wall Hydrants, Frost Resistant, Automatic Draining, Anti-Backflow Type	ASSE 1019

303.4 Identification of Materials

Each length of pipe and each pipe fitting, trap, fixture and device used in a plumbing system shall be marked in accordance with the approved applicable standard to which it is manufactured.

303.5 Installation of Materials

All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved, including the appendices which are related to installation. In the absence of such installation procedures, the manufacturer's published procedures or recommendations shall be followed.

303.6 Water Piping Quality

All potable water pipes, pipe related products and materials that join or seal pipes and pipe related products shall be evaluated and listed as conforming with a national consensus product (or material) standard and ANSI/NSF Standard 61.

303.7 Special Materials

303.7.1 Lead. See Table 303. Sheet lead shall be not less than the following:

1. For safe pans - not less than 4 psf (19.5 kg/m²) coated with an asphalt paint or equivalent.
2. For flashings of vent terminals - not less than 3 psf (14.6 kg/m²).
3. Lead bends and lead traps shall be not less than 1/8-inch (3.18 mm) wall thickness.
4. Any pipe, solder or flux which is used in the installation or repair of any plumbing in a residential or nonresidential facility providing water for human consumption shall be lead free with not more than 0.2% lead in solders and flux and not more than 8.0% lead in pipes and fittings. This does not apply to leaded joints necessary for the repair of cast iron pipes.

303.7.2 Copper. Sheet copper shall be not less than the following:

1. Safe pans - 12 oz per sq ft (3.7 kg/m²).
2. Vent terminal flashings - 8 oz per sq ft (2.4 kg/m²).

303.7.3 Caulking Ferrules. Caulking ferrules shall be manufactured from bronze, wrought copper, or brass and shall be in accordance with Table 303.7.3.

**Table 303.7.3
Caulking Ferrules**

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

1 in = 25.4 mm
1 lb = 0.4536kg

303.7.4 Soldering Bushings. Soldering bushings where permitted shall be of red brass in accordance with Table 303.7.4.

**Table 303.7.4
Soldering Bushings**

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

1 in = 25.4 mm

1 lb = 0.4536 kg

303.7.5 Floor Flanges

303.7.5.1 Floor flanges for water closets or similar fixtures shall be not less than 1/8 inch (3.18 mm) thick for brass 1/4 inch (6.35 mm) thick and not less than 2-inch (51 mm) caulking depth for cast iron or galvanized

malleable iron. Flanges shall be of the approved type. Offset closet flanges shall be prohibited, except by approval of the plumbing official. Closet screws and bolts shall be of brass.

303.7.5.2 Flanges shall be soldered to lead bends, or shall be caulked, soldered or threaded to other metal. Plastic flanges shall be joined to plastic closet bends with the approved solvent cement.

303.7.6 Cleanouts

303.7.6.1 Cleanouts shall have plugs of brass and shall conform to ASTM A 74. Cleanouts may also have plugs of approved nylon plastic. Plugs may have raised square or countersunk heads except countersunk head shall be used where raised heads may cause a hazard.

303.7.6.2 Cleanout plugs with borosilicate glass systems shall be of borosilicate glass.

303.7.7 Nonmetallic Shower Pans

303.7.7.1 Plasticized polyvinyl chloride (PVC) sheet shall be a minimum of 0.040 inch (1.02 mm) thick, and shall meet the requirements of ASTM D 4551. Sheets shall be joined by solvent welding in accordance with the manufacturer's published recommendations.

303.7.7.2 Nonplasticized chlorinated polyethylene sheet shall be a minimum 0.040 inch (1.02 mm) thick. Sheets shall be joined by solvent welding in accordance with the manufacturer's published recommendations, and shall meet the requirements of 303.8.3.

303.7.7.3 All shower pan material approved in Table 303 shall be permanently marked by the manufacturer so as to enable the inspecting authority to determine the acceptability of the material and its identification according to the code. This marking is to be conveniently readable to the inspector when the material is in its installed position.

303.8 Limitations of Use of Materials

★ 303.8.2 Plastic Pipe and Fittings Pressure Rated for Water Service Pipe

303.8.2.1 In Table 303 and Table 603, 4-digit numbers listed under "Materials" column represent the ASTM identification numbers assigned to these materials by the joint ASTM-NSF-PPI committee to assist in quick, easy identification of the materials. The numbers appear as a part of the marking on the pipe and tubing. These and no others are approved.

303.8.2.2 All plastic pipe and fittings approved in this code shall be properly marked as specified by their respective standards. All material shall be installed in accordance with the applicable ASTM standards. No materials shall be commingled within the same system except those which are specifically approved in writing in the respective standards.

303.8.2.3 Existing metallic water service piping used for electrical grounding shall not be replaced with nonmetallic pipe or tubing until other grounding means are provided which are satisfactory to the proper administrative authority having jurisdiction.

303.8.3 Plastic Pipe and Fittings for Drain, Wastes And Vents

303.8.3.1 Installations for plumbing drainage, waste and vents both above and below ground, indirect waste and storm drains shall conform to applicable standards listed in Table 303 and Table 703 and in conformity with Sections 706 and 707 of the Standard Building Code.

303.8.3.2 There shall be no commingling of different materials except through proper adapters. In all cases, approved solvent cement designated for the particular material shall be used.

303.8.3.3 Coextruded pipe with a cellular core and solid wall ABS DWV and PVC DWV plastic pipe shall be IPS Schedule 40 when used for drain, wastes and vents.

303.8.4 Stainless Steel Water Tube. Stainless steel water tube for above ground use shall conform to the standards listed in Table 603.

303.8.5 Plastic Pipe for Drains and Sewers

303.8.5.1 Coextruded PVC plastic pipe shall have a pipe stiffness of 25 (PS 25) when used for storm sewers, storm drains, foundation drains, and subsoil drains.

303.8.5.2 Coextruded PVC plastic pipe shall have a pipe stiffness of 50 (PS 50) when used for outside building sewers, storm drains, and storm sewers in accordance with 704.1, 1101.5, 1103.3 and 1103.4.

303.8.6 Plastic Piping Components and Related Materials. All plastic plumbing pipes, plastic plumbing piping components and related materials shall be listed as conforming with ANSI/NSF Standard 14.

304 PROTECTION OF PIPES

304.1 Breakage and Corrosion

Pipes passing under or through walls shall be protected from breakage. Pipes passing through concrete or cinder walls and floors or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from lime and acid of concrete, cinder or other corrosive material. Sheathing or wrapping shall allow for expansion and contraction of piping to prevent any rubbing action. Minimum wall thickness of material is to be 0.025 inch (0.635 mm).

304.2 Sleeves

304.2.1 Annular spaces between sleeves and pipes shall be filled or tightly caulked as approved by the plumbing official.

304.2.2 Annular spaces between sleeves and pipes in fire rated assemblies shall be filled or tightly caulked in accordance with the Standard Building Code.

304.3 Pipes Through Footings or Foundation Walls

A soil pipe, waste pipe, or building drain that passes under a footing or through a foundation wall shall be provided with a relieving arch, or a pipe sleeve of schedule 40 pipe shall be built into the masonry wall. Such sleeve shall be two pipe sizes greater than the pipe passing through or as may be approved in writing by the plumbing official.

304.4 Minimum Depth of Water Piping Outside of Building

Water piping outside the building line shall be installed not less than 12 inches (305 mm) deep.

304.5 Trench Location

Trenching installed parallel to footings shall not extend below the 45° (0.785 rad) bearing plane of the footing or wall unless approved by the plumbing official.

304.6 Waterproofing of Openings

Joints at the roof, around vent pipes, shall be made watertight by the use of lead, copper, galvanized steel, aluminum, plastic or other approved flashings or flashing material. Exterior wall openings shall be made watertight.

304.7 Pipes in Wood Construction

Where cutting, notching, or boring occurs within 1 1/2 inches (38 mm) of the face of wooden joists, rafters, or studs, a protective steel plate 1/16 inch (1.59 mm) thick shall be used to protect the piping. The steel plate shall be the full width of the member and shall extend at least 2 inches (51 mm) on each side of the cut, bore, or notch.

EXCEPTION: A protective plate is not required for cast iron, galvanized or black steel, and Grade H stainless steel pipe.

305 TRENCHING, EXCAVATION AND BACKFILL

305.1 Support of Piping

Buried piping shall be supported throughout its entire length.

305.2 Open Trenches

All excavations required to be made for the installation of a building drainage system, or any part thereof within the walls of a building, shall be open trench work and shall be kept open until the piping has been inspected, tested and accepted.

305.3 Mechanical Excavation

Trenches shall be properly graded and tamped to support the load of the pipe installation.

305.4 Backfilling

Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping. See Appendix I.

305.5 Tunneling

Where necessary, pipe may be installed by tunneling, jacking or a combination of both. In such cases, special care shall be exercised to protect the pipe from damage either during installation or from subsequent uneven loading. Where earth tunnels are used, adequate supporting structures shall be provided to prevent future settling or caving. Pipe may be installed in larger conduit which has been jacked through unexcavated portions of the trench.

305.6 Single Trench Prohibited

Water service pipes or any underground water pipes shall not be run or laid in the same trench as the building sewer or drainage piping, except as provided for in Chapters 6 and 7.

306 STRUCTURAL SAFETY

306.1 General

In the process of installing or repairing any part of a plumbing and drainage installation, the finished floors, walls, ceilings, tile work or any other part of the building or premises which must be changed or replaced shall be left in a safe structural condition in accordance with the requirements of the Standard Building Code.

306.2 Cutting, Notching and Boring

306.2.1 Notches on the ends of joists shall not exceed one-fourth the depth. Holes bored for pipes or cable shall not be within 2 inches (51 mm) of the top or bottom of the joist, and the diameter of any such hole shall not exceed one-third of the depth of the joist. Notches for pipes in the top or bottom of joists shall not exceed one-sixth of the depth and shall not be located in the middle one-third of the span.

306.2.2 In exterior walls and bearing partitions, any wood stud may be cut or notched to a depth not exceeding 25% of its width. Cutting or notching of studs to a depth not greater than 40% of the width of the stud is permitted in nonbearing partitions supporting no loads other than the weight of the partition.

306.2.3 A hole not greater in diameter than 40% of the stud width may be bored in any wood stud. Bored holes not greater than 60% of the width of the stud are permitted in nonbearing partitions or in any wall where each bored stud is doubled provided not more than two such successive double studs are so bored.

306.2.4 In no case shall the edge of the bored hole be nearer than 5/8 inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

307 FITTINGS

307.1 Change in Direction

307.1.1 Changes in direction in drainage piping shall be made by the appropriate use of 45° (0.785 rad) wyes, long-or-short-sweep quarter bends, one-sixth, one-eighth, or one-sixteenth bends, or by a combination of these or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical.

307.1.2 Changes in direction in Schedule 40 DWV-PVC and ABS drainage piping shall be made by the appropriate use of 45° (0.785 rad) wyes, quarter bends or long sweep quarter bends, one-sixth, one-eighth, or one-sixteenth bends, or by a combination of these or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical.

307.2 Short Sweeps

Short sweeps not less than 3-inch diameter may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical and may be used for making necessary offsets between the ceiling and the next floor above.

307.3 Prohibited Fittings

A straight tee branch shall not be used as a drainage fitting. A saddle type fitting or running threads shall not be used in the drainage or vent system. Drainage or vent piping shall not be drilled or tapped unless approved by the plumbing official. A fitting having a hub in the direction opposite to flow shall not be used in the drainage system, unless the pipe is cut by either a saw or snap cutter, which will assure clean, smooth cuts of the pipe. Double sanitary tee pattern fittings shall not receive the discharge of fixtures or appliances with pumping action discharge.

307.4 Heel or Side Inlet Bend Prohibited

Heel or side inlet quarter bend fittings shall not be used in the drainage or vent system.

307.5 Obstruction to Flow

A fitting or connection which offers abnormal obstruction to flow shall not be permitted. See 709.

307.6 Increases and Reducers

Where different sizes of pipes or pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes.

308 TYPES OF JOINTS

308.1 Tightness

Joints and connections in the plumbing system shall be gastight and watertight for the pressure required by test, with the exceptions of those portions of perforated or open-joint piping which are installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

308.2 Threaded Joints

Threaded joints shall conform to ASME B 1.20.1. All burrs shall be removed, Pipe ends shall be reamed or filed out to size of bore, and all chips shall be removed. Pipe-joint cement and sealing compound shall be used only on male threads and be insoluble and nontoxic. All pipe-joint sealants for use on potable water piping shall be listed and labeled by an approved testing laboratory.

308.3 Wiped Joints

Joints in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full-wiped joints. Wiped joints shall have an exposed surface on each side of a joint not less than 3/4 inch (19.1 mm) and at least as thick as the material being jointed. Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joints at wall or floor. Joints between lead pipe and cast iron or steel shall be formed by means of a caulking ferrule, soldering nipple, or bushing.

308.4 Flexible Couplings

Flexible couplings may be used to join plain ends of similar or dissimilar pipes and the flexible coupling shall consist of an approved gasket that is attached to the pipe with special adjustable stainless steel clamps and bolts. (See 707.4.) The flexible couplings and the approved gasket shall be oil resistant.

308.5 Precast Joints

Precast collars shall be formed on the spigot and in the bell of the pipe in advance of use. Materials shall be resistant to acids, alkalies and oils, and precast joints shall conform to the requirements of ASTM C 425, and upon installation shall be tested as provided in this code.

308.6 Cement Mortar Joints and Connections

308.6.1 Except for repairs and connections to existing lines constructed with such joints, cement mortar joints are prohibited.

308.6.2 Where permitted, cement mortar joints shall be made in the following manner: A layer of jute or hemp shall be inserted into the base of the annular joint space and packed tightly to prevent mortar from entering the interior of the pipe or fitting. Not more than 25% of the annular space shall be used for jute or hemp. The remaining space shall be filled in one continuous operation with a thoroughly mixed mortar composed of one part cement and two parts sand, with only sufficient water to make the mixture workable by hand. Additional mortar of the same composition shall then be applied to form a one to one slope with the barrel of the pipe. The bell or hub of the pipe shall be swabbed to remove any mortar or other material which may have found its way into such pipe.

308.7 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 jointed.

308.8 Joints for Plastic Pipe and Fittings

308.8.1 ABS and PVC pipe and fittings shall be solvent cemented using the proper cement recommended for the particular materials. All pipe cuts shall be square and both pipe and fittings shall be cleaned of all soil, dirt, oil and grease before applying primer or cement. Solvent joints made for pressure applications shall use primers and cements that are in compliance with the applicable ASTM standards. All solvent joints shall be made in accordance with the applicable ASTM standards and shall be allowed to dry before testing. Should any leak occur on water test, the defective joint shall be replaced. All solvent cements and primers shall comply with requirements of the ANSI/NSF 14 and shall be labeled to identify the laboratory certifying compliance for the particular cement and primer being used.

308.8.2 Plastic pipe and fittings for sewer and water pressure lines may also be joined by use of elastomeric joints when the respective standards for the materials so specify. Joints shall conform to the standards listed in either Table 603 or Table 703, as applicable, for elastomeric joints.

308.9 Grooved or Plain End Mechanical Couplings and Fittings

Grooved or plain end mechanical couplings and fittings may be used. Pipe is to be prepared in accordance with manufacturer's specifications.

308.10 Water Supply and Distribution Systems

Additional provisions for water supply and distribution systems are located in 612.

308.11 Sanitary Drainage Systems

Additional provisions for sanitary drainage systems are located in 706.

309 USE OF JOINTS

309.1 Threaded Pipe to Cast Iron

Joints between steel, brass, or copper pipe, and cast iron pipe shall be either caulked or threaded, formed as provided in 308.2 and 706.2, or shall be formed with approved adapter fittings.

309.2 Lead to Cast Iron or Steel

Joints between lead and cast iron or steel pipe shall be formed by means of wiped joints and a caulking ferrule, soldering nipple, or bushing as provided in 308.3.

309.3 Connection of Dissimilar Metals

There shall be no commingling of materials except through the use of proper fittings that make different kinds of metal pipe compatible.

309.4 Welding or Brazing

Brazing or welding shall be performed in accordance with requirements of recognized published standards of practice and by licensed or otherwise qualified mechanics. All brazing on medical gas systems shall be performed by certified

installers meeting the requirements of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications, or ANSI/AWS B 2.2, Brazing Procedure and Performance Qualification, as referenced in Chapter 14.

309.5 Slip Joints

In drainage piping, slip joints may be used on both sides of the trap and in the trap seal. Slip joints in water piping may be used on the exposed fixture supply only.

309.6 Expansion Joints

Expansion joints must be accessible and may be used where necessary to provide for expansion and contraction of the pipes.

309.7 Mechanically Formed Tee Connections

309.7.1 Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height not less than three times the thickness of the tube wall.

309.7.2 The branch shall be notched to conform with the inner curve of the run tube and dimpled to insure that penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.

309.7.3 All joints shall be brazed in accordance with 612.4. Soft soldered joints shall not be permitted.

310 HANGERS AND SUPPORTS

310.1 General

310.1.1 Strains and Stresses. Piping in a plumbing system shall be installed without undue strains or stresses and provision shall be made for expansion, contraction, and structural settlement.

310.1.2 Material. Hangers and anchors for support of pipe shall be of sufficient strength to maintain their proportionate share of the pipe alignment and to prevent sagging. Hangers shall be of a material which is compatible with the pipe and will not promote galvanic action.

310.1.3 Attachment. Hangers and anchors shall be securely attached to the building construction.

310.2 Vertical Piping

310.2.1 Attachment. Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents.

310.2.2 Cast Iron Soil Pipe. Cast iron soil pipe shall be supported at the base and at each story level at intervals not exceeding 15 ft (4572 mm).

310.2.3 Threaded Pipe. Threaded pipe shall be supported

at the base and at not less than every other story at intervals not exceeding 30 ft (9144 mm).

310.2.4 Copper Tube. Copper tube shall be supported at each story for piping 1 1/2 inches and over and at not more than 4 ft (1219 mm) intervals for piping 1 1/4 inches and smaller.

310.2.5 Lead Pipe. Lead pipe shall be supported at intervals not exceeding 4 ft (1219 mm).

310.2.6 Plastic Pipe. Plastic piping shall be supported at each story for piping 2 inches or over and not more than 4 ft (1219 mm) intervals for piping 1 1/2 inches or under.

310.2.7 Borosilicate Glass Pipe. Borosilicate glass pipe shall be supported at every floor for 3-inch, 4-inch and 6-inch diameter vertical runs and at every other floor for sizes 2 inches and smaller. Padded riser clamps with 1/4 inch (6.35 mm) thick elastomer padding shall be used, restricting sideward as well as downward movement.

310.3 Horizontal Piping

310.3.1 Supports. Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

310.3.2 Cast Iron Soil Pipe. Cast iron soil pipe shall be supported at not more than 5 ft (1524 mm) intervals on 5 ft (1524 mm) lengths and 10 ft (3048 mm) intervals on 10 ft (3048 mm) lengths. Hangers shall be located as near hubs as possible.

310.3.3 Threaded Pipe. Threaded pipe shall be supported at approximate 12 ft (3658 mm) intervals.

310.3.4 Copper Tubing. Copper tube shall be supported at approximate 8 ft (2439 mm) intervals for tubing 1 inch and smaller and 10 ft (3048 mm) intervals for tubing 1 1/4 inches and larger.

310.3.5 Lead Pipe. Lead pipe shall be supported by strips or otherwise for its entire length.

310.3.6 Plastic Pipe. Plastic piping shall be supported at not more than 4 ft (1219 mm) intervals.

310.3.7 Borosilicate Glass Pipe. Borosilicate glass pipe shall be supported in horizontal runs every 8 to 10 ft (2438 to 3048 mm), never closer unless there are more than two joints in the 8 to 10 ft (2438 to 3048 mm) section. Padded hangers shall be used, of either the clevis or trapeze type.

310.4 Repair or Replacement

Piping in concrete or masonry walls or footings shall be placed or installed in chases or recesses which will permit access to the piping for repairs or replacement.

310.5 Base of Stacks

310.5.1 Supports. Bases of all soil stacks, waste and vent

stacks shall be supported to the satisfaction of the plumbing official.

310.5.2 Piping Material. Other piping material shall be so anchored as to take the load off the stack at the base.

311 TESTS

311.1 Required Tests

The permit holder shall make the applicable tests prescribed in 311.2 thru 311.5 to assure compliance with the provisions of this code. The permit holder shall give reasonable advance notice to the plumbing official when the plumbing work is ready for tests. The equipment, material, power, and labor necessary for the inspection and test shall be furnished by the permit holder and he is responsible for assuring that the work will withstand the test pressure prescribed in the following tests. All the piping of the plumbing system shall be tested with either water or air. After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be submitted to final tests. The plumbing official may require the removal of any cleanouts to ascertain if the pressure has reached all parts of the system.

311.2 Drainage and Vent Tests

311.2.1 A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than 10 ft head of water (29.9 kPa). In testing successive sections at least the upper 10 ft (3048 mm) of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 ft (3048 mm) of the system) shall have been submitted to a test of less than a 10 ft head of water (29.9 kPa). The water shall be kept in the system, or in the portion under test, for at least 15 minutes before inspection starts; the system shall then be tight at all points.

311.2.2 An air test shall be made by attaching an air compressor or 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 gage pressure of 5 psi (34.5 kPa) or sufficient to balance a column of mercury ten inches in height (33.8 kPa). This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

EXCEPTION: Cast iron soil pipe joined with compression gaskets or mechanical couplings shall be tested with 6 psi (41.4 kPa) of air and allowed a 1 psi (6.9 kPa) reduction in pressure or a two inch (50.8 mm) drop in the column of mercury in a 15 minute period.

311.2.3 The final test of the completed drainage and vent system shall be visual and in sufficient detail to assure that

the provisions of this code have been complied with, provided, however, that, for cause, it may be necessary to subject the plumbing to either a smoke or peppermint test. Where the smoke test is preferred, it shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, they shall be closed and a pressure equivalent to a 1-inch water column (248.8 Pa) shall be maintained for 15 minutes before inspection starts. Where the peppermint test is preferred, 2 oz (59 mL) of oil of peppermint shall be introduced for each stack.

311.3 Test of Water Supply System

Upon completion of a section or of the entire water supply system, it shall be tested and proved tight under a water pressure not less than 200 psi (1379 kPa). The water used for tests shall be obtained from a potable source of supply.

311.4 Test of Building Sewer

311.4.1 Gravity sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer, filling the building sewer with water, testing with not less than a 10 ft (3048 mm) head of water and maintaining such pressure until backfill is completed.

311.4.2 Forced sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer and applying a pressure of 5 psi (34.5 kPa) greater than the pump rating, and maintaining such pressure until backfill is completed.

311.5 Test of Interior Leaders or Downspouts

Leaders or downspouts and branches within a building shall be tested by water or air in accordance with 311.2.1 or 311.2.2.

311.6 Backflow Prevention Devices

Backflow prevention devices shall be tested in accordance with CAN/CSA B64.10 or ASSE 5010.

312 APPENDIX REFERENCES

Additional general provisions are contained in the following appendices:

Appendix B - Travel Trailers and Travel Trailer Parks;
Appendix C - Mobile/Manufactured Homes and Mobile/Manufactured Home Parks; and in Appendix G - Medical Facilities Plumbing Systems. These provisions are applicable only when they are referenced in the body of the code sections or when included in the adopting ordinance.