

CHAPTER 2

DEFINITIONS

201.0 General.

For the purpose of this code, the following terms have the meanings indicated in this chapter.

No attempt is made to define ordinary words which are used in accordance with their established dictionary meanings, except where a word has been used loosely and it is necessary to define its meaning as used in this code to avoid misunderstanding.

The definitions of terms are arranged alphabetically according to the first word of the term.

202.0 Definition of Terms.

203.0

- A -

ABS - Acrylonitrile-butadiene-styrene.

Accessible - When applied to a fixture, connection, appliance, or equipment, "accessible" means having access thereto, but which first may require the removal of an access panel, door, or similar obstruction. "Readily accessible" means direct access without the necessity of removing any panel, door, or similar obstruction.

Airbreak - A physical separation which may be a low inlet into the indirect waste receptor from the fixture, appliance, or device indirectly connected.

Air Chamber - A pressure surge-absorbing device operating through the compressibility of air.

Airgap, Drainage - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe, plumbing fixture, appliance, or appurtenance conveying waste to the flood level rim of the receptor.

Airgap, Water Distribution - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet conveying potable water to the flood level rim of any tank, vat, or fixture.

Anchors - See Supports.

Approved - Acceptable to the Authority Having Jurisdiction.

Approved Testing Agency - An organization primarily established for purposes of testing to approved standards and approved by the Authority Having Jurisdiction.

Area Drain - A receptor designed to collect surface or storm water from an open area.

Aspirator - A fitting or device supplied with water

or other fluid under positive pressure which passes through an integral orifice or constriction, causing a vacuum.

Authority Having Jurisdiction - The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official; mechanical official; labor department official, health department official, building official or others having statutory authority. In the absence of a statutory authority, the Authority Having Jurisdiction may be some other responsible party. This definition shall include the Authority Having Jurisdiction's duly authorized representative.

204.0

- B -

Backflow - The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any sources other than its intended source. See Back-Siphonage, Back-Pressure Backflow.

Backflow Connection - Any arrangement whereby backflow can occur.

Back-Pressure Backflow - Backflow due to an increased pressure above the supply pressure, which may be due to pumps, boilers, gravity, or other sources of pressure.

Backflow Preventer - A device or means to prevent backflow into the potable water system.

Back-Siphonage - The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a pressure less than atmospheric in such pipe. See Backflow.

Backwater Valve - A device installed in a drainage system to prevent reverse flow.

Bathroom - A room equipped with a shower or bathtub.

Battery of fixtures - Any group of two (2) or more similar, adjacent fixtures which discharge into a common horizontal waste or soil branch.

Boiler Blowoff - An outlet on a boiler to permit emptying or discharge of sediment.

Branch - Any part of the piping system other than a main, riser, or stack.

Branch, Fixture - See Fixture Branch.

Branch, Horizontal - See Horizontal Branch.

Branch Vent - A vent connecting one or more individual vents with a vent stack or stack vent.

Building - A structure built, erected, and framed of component structural parts designed for the housing, shelter, enclosure, or support of persons, animals, or property of any kind.

Building Drain - That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer beginning two (2) feet (610 mm) outside the building wall.

Building Drain (Sanitary) - A building drain which conveys sewage only.

Building Drain (Storm) - A building drain which conveys storm water or other drainage, but no sewage.

Building Sewer - That part of the horizontal piping of a drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, private sewage disposal system, or other point of disposal.

Building Sewer (Combined) - A building sewer which conveys both sewage and storm water or other drainage.

Building Sewer (Sanitary) - A building sewer which conveys sewage only.

Building Sewer (Storm) - A building sewer which conveys storm water or other drainage, but no sewage.

Building Subdrain - That portion of a drainage system which does not drain by gravity into the building sewer.

Building Supply - The pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution on the lot. Building supply shall also mean water service.

205.0

- C -

Certified Backflow Assembly Tester - A person who has shown competence to test and maintain backflow assemblies to the satisfaction of the Authority Having Jurisdiction.

Cesspool - A lined excavation in the ground which receives the discharge of a drainage system or part thereof, so designed as to retain the organic matter and solids discharging therein, but permitting the liquids to seep through the bottom and sides.

Chemical Waste - See Special Wastes.

Clarifier - See Interceptor.

Clear Water Waste - Cooling water and condensate drainage from refrigeration and air-conditioning equipment; cooled condensate from steam heating systems; cooled boiler blowdown water.

Clinic Sink - A sink designed primarily to receive wastes from bedpans and having a flush rim, an integral trap with a visible trap seal, and the same flushing and cleansing characteristics as a water closet.

Code - A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

Combination Thermostatic/Pressure Balancing Valve - A mixing valve which senses outlet temperature and incoming hot and cold water pressure and compensates for fluctuations in incoming hot and cold water temperatures and/or pressures to stabilize outlet temperatures.

Combination Waste and Vent System - A specially designed system of waste piping embodying the horizontal wet venting of one or more sinks or floor drains by means of a common waste and vent pipe, adequately sized to provide free movement of air above the flow line of the drain.

Combined Building Sewer - See Building Sewer (Combined).

Common - That part of a plumbing system which is so designed and installed as to serve more than one (1) appliance, fixture, building, or system.

Conductor - A pipe inside the building which conveys storm water from the roof to a storm drain, combined building sewer, or other approved point of disposal.

Confined Space - A room or space having a volume less than fifty (50) cubic feet per 1000 Btu/h (1.4 m³/293 W) of the aggregate input rating of all fuel-burning appliances installed in that space.

Contamination - An impairment of the quality of the potable water which creates an actual hazard to the public health through poisoning or through the spread of disease by sewage, industrial fluids, or waste. Also defined as High Hazard.

Continuous Vent - A vertical vent that is a continuation of the drain to which it connects.

Continuous Waste - A drain connecting the compartments of a set of fixtures to a trap or connecting other permitted fixtures to a common trap.

CPVC - Chlorinated Poly (Vinyl Chloride).

Critical Level - The critical level (C-L or C/L) marking on a backflow prevention device or vacuum breaker is a point conforming to approved standards

expressed as the fall in a fraction of an inch (mm) or percentage slope per foot (meter) length of pipe.

Grease Interceptor - An interceptor of at least 750 gallon (2839 L) capacity to serve one (1) or more fixtures and which shall be remotely located.

Grease Trap - A device designed to retain grease from one (1) to a maximum of four (4) fixtures.

210.0

- H -

Hangers - See Supports.

High Hazard - See Contamination.

Horizontal Branch - A drain pipe extending laterally from a soil or waste stack or building drain with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or to the building drain.

Horizontal Pipe - Any pipe or fitting which is installed in a horizontal position or which makes an angle of less than forty-five (45) degrees with the horizontal.

House Drain - See Building Drain.

House Sewer - See Building Sewer.

211.0

- I -

Indirect Waste Pipe - A pipe that does not connect directly with the drainage system but conveys liquid wastes by discharging into a plumbing fixture, interceptor, or receptacle which is directly connected to the drainage system.

Individual Vent - A pipe installed to vent a fixture trap and which connects with the vent system above the fixture served or terminates in the open air.

Industrial Waste - Any and all liquid or water-borne waste from industrial or commercial processes, except domestic sewage.

Insanitary - A condition which is contrary to sanitary principles or is injurious to health.

Conditions to which "insanitary" shall apply include the following:

- (1) Any trap which does not maintain a proper trap seal.
- (2) Any opening in a drainage system, except where lawful, which is not provided with an approved water-sealed trap.
- (3) Any plumbing fixture or other waste-discharging receptor or device, which is not supplied with water sufficient to flush and maintain the fixture or receptor in a clean condition.

- (4) Any defective fixture, trap, pipe, or fitting.
- (5) Any trap, except where in this code exempted, directly connected to a drainage system, the seal of which is not protected against siphonage and back-pressure by a vent pipe.
- (6) Any connection, cross-connection, construction, or condition, temporary or permanent, which would permit or make possible by any means whatsoever, for any unapproved foreign matter to enter a water distribution system used for domestic purposes.
- (7) The foregoing enumeration of conditions to which the term "insanitary" shall apply shall not preclude the application of that term to conditions that are, in fact, insanitary.

Interceptor (Clarifier) - A device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes and permit normal sewage or liquid wastes to discharge into the disposal terminal by gravity.

Invert - The lowest portion of the inside of a horizontal pipe.

212.0

- J -

Joint, Brazed - Any joint obtained by joining of metal parts with alloys which melt at temperatures higher than 840°F (449°C), but lower than the melting temperature of the parts to be joined.

Joint, Soldered - A joint obtained by the joining of metal parts with metallic mixtures or alloys which melt at a temperature up to and including 840°F (449°C).

213.0

- K -

No definitions

214.0

- L -

Labeled - Equipment or materials bearing a label of a listing agency (accredited conformity assessment body). See Listed (third party certified).

Lavatories in Sets - Two (2) or three (3) lavatories that are served by one (1) trap.

Leader - An exterior vertical drainage pipe for conveying storm water from roof or gutter drains. See Downspout.

Liquid Waste - The discharge from any fixture, appliance, or appurtenance in connection with a plumbing system which does not receive fecal matter.

and established by the testing laboratory (usually stamped on the device by the manufacturer) which determines the minimum elevation above the flood level rim of the fixture or receptor served at which the device may be installed. When a backflow prevention device does not bear a critical level marking, the bottom of the vacuum breaker, combination valve, or the bottom of any such approved device shall constitute the critical level.

Cross-Connection - Any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptor, equipment, or device, through which it may be possible for non-potable, used, unclean, polluted and contaminated water, or other substances to enter into any part of such potable water system under any condition.

206.0 - D -

Department Having Jurisdiction - The Authority Having Jurisdiction, including any other law enforcement agency affected by any provision of this code, whether such agency is specifically named or not.

Developed Length - The length along the center line of a pipe and fittings.

Diameter - Unless specifically stated, "diameter" is the nominal diameter as designated commercially.

Domestic Sewage - The liquid and water-borne wastes derived from the ordinary living processes, free from industrial wastes, and of such character as to permit satisfactory disposal, without special treatment, into the public sewer or by means of a private sewage disposal system.

Downspout - The rainleader from the roof to the building storm drain, combined building sewer, or other means of disposal located outside of the building. See Conductor and Leader.

Drain - Any pipe which carries waste or water-borne wastes in a building drainage system.

Drainage System - Includes all the piping within public or private premises which conveys sewage or other liquid wastes to a legal point of disposal, but does not include the mains of a public sewer system or a public sewage treatment or disposal plant.

Durham System - A soil or waste system in which all piping is threaded pipe, tubing, or other such rigid construction, using recessed drainage fittings to correspond to the types of piping.

207.0 - E -

Effective Opening - The minimum cross-sectional area at the point of water supply discharge measured

or expressed in terms of (1) diameter of a circle or (2) if the opening is not circular, the diameter of a circle of equivalent cross-sectional area. (This is applicable also to airgap.)

Essentially Nontoxic Transfer Fluid - Essentially nontoxic at practically nontoxic, Toxicity Rating Class 1 (reference "Clinical Toxicology of Commercial Products" by Gosselin, Smith, Hodge, & Braddock).

Existing Work - A plumbing system or any part thereof which has been installed prior to the effective date of this code.

208.0 - F -

Fixture Branch - A water supply pipe between the fixture supply pipe and the water distributing pipe.

Fixture Drain - The drain from the trap of a fixture to the junction of that drain with any other drain pipe.

Fixture Supply - A water supply pipe connecting the fixture with the fixture branch.

Fixture Unit - A quantity in terms of which the load-producing effects on the plumbing system of different kinds of plumbing fixtures are expressed on some arbitrarily chosen scale.

Flammable Vapor or Fumes is the concentration of flammable constituents in air that exceeds 25 percent of its lower flammability limit (LFL).

Flood Level - See Flooded.

Flood-Level Rim - The top edge of a receptor from which water overflows.

Flooded - A fixture is flooded when the liquid therein rises to the flood level rim.

Flush Tank - A tank located above or integral with water closets, urinals, or similar fixtures for the purpose of flushing the usable portion of the fixture.

Flush Valve - A valve located at the bottom of a tank for the purpose of flushing water closets and similar fixtures.

Flushometer Tank - A tank integrated within an air accumulator vessel which is designed to discharge a predetermined quantity of water to fixtures for flushing purposes.

Flushometer Valve - A valve which discharges a predetermined quantity of water to fixtures for flushing purposes and is actuated by direct water pressure.

209.0 - G -

Gang or Group Shower - Two or more showers in a common area.

Grade - The slope or fall of a line of pipe in reference to a horizontal plane. In drainage, it is usually

nor does it add any discharge load to a fixture or the drainage system. It performs some useful function in the operation, maintenance, servicing, economy, or safety of the plumbing system.

Plumbing Fixture - An approved-type installed receptacle, device, or appliance which is supplied with water or which receives liquid or liquid-borne wastes and discharges such wastes into the drainage system to which it may be directly or indirectly connected. Industrial or commercial tanks, vats, and similar processing equipment are not plumbing fixtures, but may be connected to or discharged into approved traps or plumbing fixtures when and as otherwise provided for elsewhere in this code.

Plumbing Official - See Authority Having Jurisdiction.

Plumbing System - Includes all potable water, building supply, and distribution pipes, all plumbing fixtures and traps, all drainage and vent pipes, and all building drains and building sewers, including their respective joints and connections, devices, receptors, and appurtenances within the property lines of the premises and shall include potable water piping, potable water treating or using equipment, medical gas and medical vacuum systems, and water heaters.

Pollution - An impairment of the quality of the potable water to a degree which does not create a hazard to the public health but which does adversely and unreasonably affect the aesthetic qualities of such potable water for domestic use. Also defined as Low Hazard.

Potable Water - Water that is satisfactory for drinking, culinary, and domestic purposes and that meets the requirements of the Health Authority Having Jurisdiction.

PP - Polypropylene.

Pressure - The normal force exerted by a homogeneous liquid or gas, per unit of area, on the wall of the container.

(1) **Static Pressure** - The pressure existing without any flow.

(2) **Residual Pressure** - The pressure available at the fixture or water outlet after allowance is made for pressure drop due to friction loss, head, meter, and other losses in the system during maximum demand periods.

Pressure Balancing Valve - A mixing valve which senses incoming hot and cold water pressures and compensates for fluctuations in either to stabilize outlet temperature.

Private or Private Use - Applies to plumbing fixtures in residences and apartments, to private

bathrooms in hotels and hospitals, and to restrooms in commercial establishments where the fixtures are intended for the use of a family or an individual.

Private Sewage Disposal System - A septic tank with the effluent discharging into a subsurface disposal field, into one or more seepage pits, or into a combination of subsurface disposal field and seepage pit or of such other facilities as may be permitted under the procedures set forth by other regulating agencies.

Private Sewer - A building sewer which receives the discharge from more than one (1) building drain and conveys it to a public sewer, private sewage disposal system, or other point of disposal.

Public or Public Use - All buildings or structures that are not defined as private or private use.

Public Sewer - A common sewer directly controlled by public authority.

PVC - Poly(vinyl chloride).

219.0

- Q -

No definitions.

220.0

- R -

Receptor - An approved plumbing fixture or device of such material, shape, and capacity as to adequately receive the discharge from indirect waste pipes, so constructed and located as to be readily cleaned.

Regulating Equipment - Includes all valves and controls used in a plumbing system which are required to be accessible or readily accessible.

Relief Vent - A vent, the primary function of which is to provide circulation of air between drainage and vent systems or to act as an auxiliary vent on a specially designed system.

Remote Outlet - When used for sizing water piping, it is the furthest outlet dimension, measuring from the meter, either the developed length of the cold-water piping or through the water heater to the furthest outlet on the hot-water piping.

Rim - See Flood-Level Rim.

Riser - A water supply pipe which extends vertically one (1) full story or more to convey water to branches or fixtures.

Roof Drain - A drain installed to receive water collecting on the surface of a roof and to discharge it into a leader, downspout, or conductor.

Roughing-in - The installation of all parts of the plumbing system which can be completed prior to the installation of fixtures. This includes drainage, water supply, and vent piping and the necessary fixture supports.

Listed (Third party certified) - Equipment or materials included in a list published by a listing agency (accredited conformity assessment body) that maintains periodic inspection on current production of listed equipment or materials and whose listing states either that the equipment or material complies with approved standards or has been tested and found suitable for use in a specified manner.

Listing Agency - An agency accredited by an independent and authoritative conformity assessment body to operate a material and product listing and labeling (certification) system and which is accepted by the Authority Having Jurisdiction which is in the business of listing or labeling. The system includes initial and ongoing product testing, a periodic inspection on current production of listed (certified) products, and which makes available a published report of such listing in which specific information is included that the material or product conforms to applicable standards and found safe for use in a specific manner.

Lot - A single or individual parcel or area of land legally recorded or validated by other means acceptable to the Authority Having Jurisdiction on which is situated a building or which is the site of any work regulated by this code, together with the yards, courts, and unoccupied spaces legally required for the building or works, and which is owned by or is in the lawful possession of the owner of the building or works.

Low Hazard - See Pollution.

215.0

- M -

Macerating Toilet System - A system comprising of a sump with macerating pump and with connections for a water closet and other plumbing fixtures, which is designed to accept, grind, and pump wastes to an approved point of discharge.

Main - The principal artery of any system of continuous piping to which branches may be connected.

Main Sewer - See Public Sewer.

Main Vent - The principal artery of the venting system to which vent branches may be connected.

May - A permissive term.

Mobile Home Park Sewer - That part of the horizontal piping of a drainage system which begins two (2) feet (610 mm) downstream from the last mobile home site and conveys it to a public sewer, private sewer, private sewage disposal system, or other point of disposal.

216.0

- N -

Nuisance - Includes, but is not limited to:

- (1) Any public nuisance known at common law or in equity jurisprudence.
- (2) Whenever any work regulated by this code is dangerous to human life or is detrimental to health and property.
- (3) Inadequate or unsafe water supply or sewage disposal system.

217.0

- O -

Offset - A combination of elbows or bends in a line of piping which brings one section of the pipe out of line but into a line parallel with the other section.

Oil Interceptor - See Interceptor.

218.0

- P -

PB - Polybutylene.

PE - Polyethylene.

PE-AL-PE - Polyethylene-aluminum-polyethylene.

PEX - Cross-linked polyethylene.

PEX-AL-PEX - Cross-linked polyethylene—aluminum-cross-linked polyethylene.

Person - A natural person, his heirs, executor, administrators, or assigns and shall also include a firm, corporation, municipal or quasi-municipal corporation, or governmental agency. Singular includes plural, male includes female.

Pipe - A cylindrical conduit or conductor conforming to the particular dimensions commonly known as "pipe size."

Plumbing - The business, trade, or work having to do with the installation, removal, alteration, or repair of plumbing systems or parts thereof.

Plumbing Appliance - Any one of a special class of devices or equipment which is intended to perform a special plumbing function. Its operation and/or control may be dependent upon one or more energized components, such as motors, controls, heating elements, or pressure- or temperature-sensing elements. Such device or equipment may operate automatically through one or more of the following actions: a time cycle, a temperature range, a pressure range, a measured volume or weight; or the device or equipment may be manually adjusted or controlled by the user or operator.

Plumbing Appurtenance - A manufactured device, a prefabricated assembly, or an on-the-job assembly of component parts, which is an adjunct to the basic piping system and plumbing fixtures. An appurtenance demands no additional water supply,

Crown Weir (Trap Weir) - The lowest point in the cross section of the horizontal waterway at the exit of the trap.

Top Dip (of trap) - The highest point in the internal cross section of the trap at the lowest part of the bend (inverted siphon). By contrast, the bottom dip is the lowest point in the internal cross section.

223.0 - U -

Unconfined Space - A room or space having a volume equal to at least 50 cubic feet per 1000 Btu/h (1.4 m³/293 W) of the aggregate input rating of all fuel-burning appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

Unsanitary - See Insanitary.

224.0 - V -

Vacuum - Any pressure less than that exerted by the atmosphere.

Vacuum Breaker - See Backflow Preventer.

Vacuum Relief Valve - A device that prevents excessive vacuum in a pressure vessel.

Vent - Any pipe provided to ventilate a plumbing system, to prevent trap siphonage and back pressure, or to equalize the air pressure within the drainage system.

Vent Pipe - See Vent.

Vent Stack - The vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

Vent System - A pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and back-pressure.

Vertical Pipe - Any pipe or fitting which is installed in a vertical position or which makes an angle of not more than forty-five (45) degrees with the vertical.

225.0 - W -

Wall-Hung Water Closet - A water closet installed in such a way that no part of the water closet touches the floor.

Waste - See Liquid Waste and Industrial Waste.

Waste Pipe - A pipe which conveys only liquid waste, free of fecal matter.

Water Conditioning or Treating Device - A device which conditions or treats a water supply so as to

change its chemical content or remove suspended solids by filtration.

Water-Distributing Pipe - In a building or premises, a pipe which conveys potable water from the building supply pipe to the plumbing fixtures and other water outlets.

Water Hammer Arrester - A device to absorb hydraulic shock, either of the air chamber or mechanical device design.

Water Main (Street Main) - A water supply pipe for public or community use.

Water Supply System - The building supply pipe, the water distributing pipes and the necessary connecting pipes, fittings, control valves, backflow prevention devices, and all appurtenances carrying or supplying potable water in or adjacent to the building or premises.

Welded Joint or Seam - Any joint or seam obtained by the joining of metal parts in the plastic molten state.

Welder, Pipe - A person who specializes in the welding of pipes and holds a valid certificate of competency from a recognized testing laboratory, based on the requirements of the ASME Boiler and Pressure Vessels code, Section IX.

Wet Vent - A vent which also serves as a drain.

Whirlpool Bathtub - A bathtub fixture equipped and fitted with a circulating piping system designed to accept, circulate, and discharge bathtub water upon each use.

226.0 - X -

No definitions.

227.0 - Y -

Yoke Vent - A pipe connecting upward from a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stacks.

228.0 - Z -

No definitions.

221.0

- S -

Sand Interceptor - See Interceptor.

SDR - An abbreviation for "standard dimensional ratio," which is the specific ratio of the average specified outside diameter to the minimum wall thickness for outside controlled diameter plastic pipe.

Seepage Pit - A lined excavation in the ground which receives the discharge of a septic tank so designed as to permit the effluent from the septic tank to seep through its bottom and sides.

Septic Tank - A watertight receptacle which receives the discharge of a drainage system or part thereof, designed and constructed so as to retain solids, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside of the tank through a system of open joint piping or a seepage pit.

Sewage - Any liquid waste containing animal or vegetable matter in suspension or solution and that may include liquids containing chemicals in solution.

Sewage Ejector - A device for lifting sewage by entraining it on a high-velocity jet stream, air, or water.

Sewage Pump - A permanently installed mechanical device, other than an ejector, for removing sewage or liquid waste from a sump.

Shall - Indicates a mandatory requirement.

Shielded Coupling - An approved elastomeric sealing gasket with an approved outer shield and a tightening mechanism.

Shock Arrester - See Water Hammer Arrester.

Should - Indicates a recommendation or that which is advised but not required.

Single Family Dwelling - A building designed to be used as a home by the owner of such building, which shall be the only dwelling located on a parcel of ground with the usual accessory buildings.

Size and Type of Tubing - See Diameter.

Slip Joint - An adjustable tubing connection, consisting of a compression nut, a friction ring, and a compression washer, designed to fit a threaded adapter fitting, or a standard taper pipe thread.

Slope - See Grade.

Soil Pipe - Any pipe which conveys the discharge of water closets, urinals, clinic sinks, or fixtures having similar functions of collection and removal of domestic sewage, with or without the discharge from other fixtures, to the building drain or building sewer.

Special Wastes - Wastes which require some

special method of handling, such as the use of indirect waste piping and receptors, corrosion resistant piping, sand, oil or grease interceptors, condensers, or other pretreatment facilities.

Stack - The vertical main of a system of soil, waste, or vent piping extending through one or more stories.

Stack Vent - The extension of a soil or waste stack above the highest horizontal drain connected to the stack.

Standard - A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

Storm Drain - See Building Drain (Storm).

Storm Sewer - A sewer used for conveying rainwater, surface water, condensate, cooling water, or similar liquid wastes.

Subsoil Drain - A drain which collects subsurface or seepage water and conveys it to a place of disposal.

Sump - An approved tank or pit which receives sewage or liquid waste and which is located below the normal grade of the gravity system and which must be emptied by mechanical means.

Supports - Supports, hangers, and anchors are devices for properly supporting and securing pipe, fixtures, and equipment.

222.0

- T -

Tailpiece - The pipe or tubing that connects the outlet of a plumbing fixture to a trap.

Thermostatic (Temperature Control) Valve - A mixing valve which senses outlet temperature and compensates for fluctuations in incoming hot or cold water temperatures.

Trap - A fitting or device so designed and constructed as to provide, when properly vented, a liquid seal which will prevent the back passage of air without materially affecting the flow of sewage or waste water through it.

Trap Arm - That portion of a fixture drain between a trap and the vent.

Trap Primer - A device and system of piping that maintains a water seal in a remote trap.

Trap Seal - The vertical distance between the crown weir and the top dip of the trap.

CHAPTER 6

WATER SUPPLY AND DISTRIBUTION

601.0 Running Water Required.

601.1 Except where not deemed necessary for safety or sanitation by the Authority Having Jurisdiction, each plumbing fixture shall be provided with an adequate supply of potable running water piped thereto in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of backflow or cross-connection. Water closets and urinals shall be flushed by means of an approved flush tank or flushometer valve. In jurisdictions which adopt Appendix J, water closets, urinals, and trap primers in designated non-residential buildings may be provided with reclaimed water as defined and regulated by Appendix J of this code.

601.2 **Identification of a Potable and Nonpotable Water System.** In all buildings where potable water and nonpotable water systems are installed, each system shall be clearly identified. Each system shall be color coded as follows:

601.2.1 **Potable Water** – Green background with white lettering.

601.2.2 **Nonpotable Water** – Yellow background with black lettering, with the words "Caution: Nonpotable water, do not drink."

Each system shall be identified with a colored band to designate the liquid being conveyed, and the direction of normal flow shall be clearly shown. The minimum size of the letters and length of the color field shall conform to Table 6-1.

A colored identification band shall be indicated every twenty (20) feet (6096 mm) but at least once per room, and shall be visible from the floor level.

Where vacuum breakers or backflow preventers are installed with fixtures listed in Table 14-1, identification of the discharge side may be omitted. Each outlet on the nonpotable water line which could be used for special purposes shall be posted as follows:

"Caution: Nonpotable water, do not drink."

601.2.3 **Reclaimed Water** – Purple (Pantone color #512) background and shall be imprinted in nominal 1/2 in. (12.7 mm) high, black upper case letters, with the words "Caution: Reclaimed water, do not drink."

601.3 Faucets and diverters shall be connected to the water distribution system so that hot water corresponds to the left side of the fittings.

TABLE 6-1

Minimum Length of Color Field and Size of Letters

Outside Diameter of Pipe or Covering		Minimum Length of Color Field		Minimum Size of Letters	
Inches	(mm)	Inches	(mm)	Inches	(mm)
1/2 to 1-1/4	(15 to 32)	8	(203)	1/2	(12.7)
1-1/2 to 2	(40 to 50)	8	(203)	3/4	(19.1)
2-1/2 to 6	(65 to 150)	12	(305)	1-1/4	(32)
8 to 10	(200 to 250)	24	(619)	2-1/2	(64)
Over 10	(Over 250)	32	(813)	3-1/2	(89)

602.0 Unlawful Connections

602.1 No installation of potable water supply piping or part thereof shall be made in such a manner that it will be possible for used, unclean, polluted, or contaminated water, mixtures, or substances to enter any portion of such piping from any tank, receptor, equipment, or plumbing fixture by reason of back-siphonage, suction, or any other cause, either during normal use and operation thereof or when any such tank, receptor, equipment, or plumbing fixture is flooded or subject to pressure in excess of the operating pressure in the hot or cold water piping.

602.2 No person shall make a connection or allow one to exist between pipes or conduits carrying domestic water supplied by any public or private water service system, and any pipes, conduits, or fixtures containing or carrying water from any other source or containing or carrying water which has been used for any purpose whatsoever, or any piping carrying chemicals, liquids, gases, or any substances whatsoever, unless there is provided a backflow prevention device approved for the potential hazard and maintained in accordance with this code.

602.3 No plumbing fixture, device, or construction shall be installed or maintained or shall be connected to any domestic water supply when such installation or connection may provide a possibility of polluting such water supply or may provide a cross-connection between a distributing system of water for drinking and domestic purposes and water which may become contaminated by such plumbing fixture, device, or construction unless there is provided a backflow prevention device approved for the potential hazard.

602.4 No water piping supplied by any private water supply system shall be connected to any other

source of supply without the approval of the Authority Having Jurisdiction, Health Department, or other Department Having Jurisdiction.

603.0 Cross-Connection Control.

Cross-connection control shall be provided in accordance with the provisions of this chapter.

No person shall install any water operated equipment or mechanism, or use any water-treating chemical or substance, if it is found that such equipment, mechanism, chemical, or substance may cause pollution or contamination of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with an approved backflow prevention device or assembly.

603.1 Approval of Devices or Assemblies. Before any device or assembly is installed for the prevention of backflow, it shall have first been approved by the Authority Having Jurisdiction. Devices or assemblies shall be tested for conformity with recognized standards or other standards acceptable to the Authority Having Jurisdiction which are consistent with the intent of this code.

All devices or assemblies installed in a potable water supply system for protection against backflow shall be maintained in good working condition by the person or persons having control of such devices or assemblies. The Authority Having Jurisdiction or other department having jurisdiction may inspect such devices or assemblies and, if found to be

TABLE 6-2
Backflow Prevention Devices, Assemblies, and Methods

Device, Assembly, or Method	Degree of Hazard				Installation ^{2,3}
	Pollution (Low Hazard)		Contamination (High Hazard)		
	Back- Siphonage	Back- Pressure	Back- Siphonage	Back- Pressure	
Airgap	x		x		See Table 6-3 in this chapter.
Atmospheric Vacuum Breaker	x		x		Upright position. No valve downstream. Minimum of six (6) inches (152 mm) or listed distance above all downstream piping and flood-level rim of receptor. ^{4,5}
Spill-Proof Pressure-Type Vacuum Breaker	x		x		Upright position. Minimum of six (6) inches (152 mm) or listed distance above all downstream piping and flood-level rim of receptor. ³
Double Check Valve Backflow Preventer	x	x			Horizontal, unless otherwise listed. Requires one (1) foot (305 mm) minimum clearance at bottom for maintenance. May need platform/ladder for test and repair. Does not discharge water.
Pressure Vacuum Breaker	x		x		Upright position. May have valves downstream. Minimum of twelve (12) inches (305 mm) above all downstream piping and flood-level rim of receptor. May discharge water.
Reduced Pressure Principle Backflow Preventer	x	x	x	x	Horizontal unless otherwise listed. Requires one (1) foot (305 mm) minimum clearance at bottom for maintenance. May need platform ladder for test and repair. May discharge water.

¹ See description of devices and assemblies in this chapter.

² Installation in pit or vault requires previous approval by the Authority Having Jurisdiction.

³ Refer to general and specific requirement for installation.

⁴ Not to be subjected to operating pressure for more than 12 hours in any 24 hour period.

⁵ For deck-mounted and equipment-mounted vacuum breaker, see Section 603.4.16.

defective or inoperative, shall require the repair or replacement thereof. No device or assembly shall be removed from use or relocated or other device or assembly substituted, without the approval of the Authority Having Jurisdiction.

603.2 Backflow Prevention Devices, Assemblies, and Methods.

603.2.1 Airgap. The minimum airgap to afford backflow protection shall be in accordance with Table 6-3.

603.2.2 Atmospheric Vacuum Breaker (AVB). An atmospheric vacuum breaker consists of a body, a checking member, and an atmospheric opening.

603.2.3 Hose Connection Backflow Preventer. A hose connection backflow preventer consists of two independent check valves with an independent atmospheric vent between and a means of field testing and draining.

603.2.4 Double Check Valve Backflow Prevention Assembly (DC). A double check valve backflow prevention assembly consists of two independently acting internally loaded check valves, four properly located test cocks, and two isolation valves.

603.2.5 Pressure Vacuum Breaker Backflow Prevention Assembly (PVB). A pressure vacuum breaker backflow prevention assembly consists of a loaded air inlet valve, an internally loaded check valve, two (2) properly located test cocks, and two (2) isolation valves. This device shall be installed outdoors only if provisions for spillage are provided.

603.2.6 Pressure Vacuum Breaker Spill-Proof Type Backflow Prevention Assembly (SVB). A pressure type vacuum breaker backflow prevention assembly consisting of one (1) check valve force-loaded closed and an air inlet vent valve force-loaded open to atmosphere,

**TABLE 6-3
Minimum Airgaps for Water Distribution⁴**

Fixtures	When not affected by side walls ¹		When affected by side wall ²	
	Inches	(mm)	Inches	(mm)
Effective openings ³ not greater than one-half (1/2) inch (12.7 mm) in diameter	1	(25.4)	1-1/2	(38)
Effective openings ³ not greater than three-quarters (3/4) inch (20 mm) in diameter	1-1/2	(38)	2-1/4	(57)
Effective openings ³ not greater than one (1) inch (25 mm) in diameter	2	(51)	3	(76)
Effective openings ³ greater than one (1) inch (25 mm) in diameter	Two (2) times diameter of effective opening		Three (3) times diameter of effective opening	

¹ Side walls, ribs, or similar obstructions do not affect airgaps when spaced from the inside edge of the spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the effective opening for two intersecting walls.

² Vertical walls, ribs, or similar obstructions extending from the water surface to or above the horizontal plane of the spout opening other than specified in Note 1 above. The effect of three or more such vertical walls or ribs has not been determined. In such cases, the airgap shall be measured from the top of the wall.

³ The effective opening shall be the minimum cross-sectional area at the seat of the control valve or the supply pipe or tubing which feeds the device or outlet. If two or more lines supply one outlet, the effective opening shall be the sum of the cross-sectional areas of the individual supply lines or the area of the single outlet, whichever is smaller.

⁴ Airgaps less than one (1) inch (25.4 mm) shall be approved only as a permanent part of a listed assembly that has been tested under actual backflow conditions with vacuums of 0 to 25 inches (635 mm) of mercury.

positioned downstream of the check valve, and located between and including two (2) tightly closing shutoff valves and test cocks.

603.2.7 Reduced Pressure Principle Backflow Prevention Assembly (RP). A reduced pressure principle backflow prevention assembly consists of two independently acting internally loaded check valves, a differential pressure relief valve, four properly located test cocks, and two isolation valves.

603.3 General Requirements.

603.3.1 All assemblies shall conform to listed standards and be acceptable to the Authority Having Jurisdiction with jurisdiction over the selection and installation of backflow prevention assemblies.

603.3.2 Where more than one (1) backflow prevention valve is installed on a single premise, and the valves are installed in one location, each separate valve shall be permanently identified by the permittee in a manner satisfactory to the Authority Having Jurisdiction.

603.3.3 The premise owner or responsible person shall have the backflow prevention assembly tested by a certified backflow assembly tester at the time of installation, repair, or relocation and when required by the Authority Having Jurisdiction. The testing shall be performed in accordance with the procedures referenced in Table 14-1 by a tester qualified in accordance with those standards.

603.3.4 Access and clearance shall be provided for the required testing, maintenance, and repair. Access and clearance shall require a minimum of one (1) foot (305 mm) between the lowest portion of the assembly and grade, floor, or platform. Installations elevated more than five (5) feet (1524 mm) above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

603.3.5 Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection. Where potable water is discharged to the drainage system it shall be by means of an approved airgap of two (2) pipe diameters of the supply inlet, but in no case shall the gap be less than one (1) inch (25 mm). Connection may be made to the inlet side of a trap provided that an approved vacuum breaker is installed not less than six (6) inches (152 mm) or the distance according to the device's listing, above the flood-level rim of such trapped fixture, so that at no time will any such device be subjected to any back-pressure.

603.3.6 Backflow preventers for hot water over 110°F (43.3°C) shall be a type designed to operate at temperatures of 110°F (43.3°C) or more without rendering any portion of the assembly inoperative.

603.3.7 Fixtures, appliances, or appurtenances with integral backflow preventers or integral airgaps manufactured as a unit shall be installed in accordance with their listing requirements and the manufacturers' instructions.

603.3.8 In cold climate areas, backflow assemblies and devices shall be protected from freezing by a method acceptable to the Authority Having Jurisdiction.

603.4 Specific Requirements.

603.4.1 Water closet and urinal flushometer valves shall be equipped with an atmospheric vacuum breaker. The vacuum breaker shall be installed on the discharge side of the flushometer valve with the critical level at least six (6) inches (152 mm) or the distance according to its listing above the overflow rim of a water closet bowl or the highest part of a urinal.

603.4.2 Water closet and urinal tanks shall be equipped with a ballcock. The ballcock shall be installed with the critical level at least one (1) inch (25.4 mm) above the full opening of the overflow pipe. In cases where the ballcock has no hush tube, the bottom of the water supply inlet shall be installed one (1) inch (25.4 mm) above the full opening of the overflow pipe.

603.4.3 Water closet flushometer tanks shall be protected against backflow by an approved backflow prevention assembly, device, or method.

603.4.4 Heat Exchangers.

603.4.4.1 Heat exchangers used for heat transfer, heat recovery, or solar heating shall protect the potable water system from being contaminated by the heat transfer medium. Double-wall heat exchangers shall separate the potable water from the heat transfer medium by providing a space between the two walls which is vented to the atmosphere.

603.4.5 Water supply inlets to tanks, vats, sumps, swimming pools, and other receptors shall be protected by one of the following means:

- (1) An approved airgap;
- (2) A listed vacuum breaker installed on the discharge side of the last valve with the critical level not less than six (6) inches (152 mm) or in accordance with its listing;
- (3) A backflow preventer suitable for the contamination or pollution, installed in

accordance with the requirements for that type of device or assembly as set forth in this chapter.

603.4.6 Protection from Lawn Sprinklers and Irrigation Systems.

603.4.6.1 Potable water supplies to systems having no pumps or connections for pumping equipment, and no chemical injection or provisions for chemical injection, shall be protected from backflow by one of the following devices:

- (1) Atmospheric vacuum breaker
- (2) Pressure vacuum breaker
- (3) Reduced pressure backflow preventer
- (4) Double check valve backflow preventer

603.4.6.2 Where sprinkler and irrigation systems have pumps, connections for pumping equipment, or auxiliary air tanks or are otherwise capable of creating back-pressure, the potable water supply shall be protected by the following type of device if the backflow device is located upstream from the source of back-pressure.

- (1) Reduced pressure backflow preventer

603.4.6.3 Where systems have a backflow device installed downstream from a potable water supply pump or a potable water supply pump connection, the device shall be one of the following:

- (1) Atmospheric vacuum breaker
- (2) Pressure vacuum breaker
- (3) Reduced pressure backflow preventer
- (4) Double check valve backflow preventer

603.4.6.4 Where systems include a chemical injector or any provisions for chemical injection, the potable water supply shall be protected by the following:

- (1) Reduced pressure backflow preventer

603.4.7 Potable water outlets with hose attachments, other than water heater drains, boiler drains, and clothes washer connections, shall be protected by a non-removable hose bibb type backflow preventer, a non-removable hose bibb type vacuum breaker, or by an atmospheric vacuum breaker installed at least six (6) inches (152 mm) above the highest point of usage located on the discharge side of the last valve. In climates where freezing temperatures occur, a listed self-draining frost-proof hose bibb with an integral backflow preventer or vacuum breaker shall be used for horizontal. Exterior vertical yard hydrants shall be of the self-draining

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sanitary type or be provided with backflow protection by a double-check valve backflow preventer.

603.4.8 DELETED.

603.4.9 Water cooled compressors, de-greasers or any other water cooled equipment shall be protected by a backflow preventer installed in accordance with the requirements of this chapter.

Note:

Water cooled equipment which produces back-pressure shall be equipped with the appropriate protection.

603.4.10 Water inlets to water supplied aspirators shall be equipped with a vacuum breaker installed in accordance with its listing requirements and this chapter. The discharge shall drain through an air gap. When the tailpiece of a fixture to receive the discharge of an aspirator is used, the air gap shall be located above the flood-level rim of the fixture.

603.4.11 Potable water make up connections to steam or hot water boilers shall be provided with a listed backflow protection assembly.

603.4.12 Nonpotable Water Piping. In cases where it is impractical to correct individual cross-connections on the domestic water line, the line supplying such outlets shall be considered a non-potable water line. No drinking or domestic water outlets shall be connected to the non-potable water line. Whenever possible, all portions of the non-potable water line shall be exposed, and all exposed portions shall be properly identified in a manner satisfactory to the Authority Having Jurisdiction. Each outlet on the non-potable water line which may be used for drinking or domestic purposes shall be posted: "Caution: Non-potable water, do not drink."

603.4.13 Potable water supply to carbonators shall be protected by either an airgap or a vented backflow preventer for carbonated beverage dispensers installed within the carbonated beverage dispenser. The carbonated beverage dispenser shall bear the label of an approved testing agency, certifying and attesting that such equipment has been tested and inspected and meets the requirements of the approved applicable standard. Carbonated beverage dispensers without an approved internal airgap or vented backflow preventer for carbonated beverage dispensers and carbonated beverage dispensing systems shall have the water supply protected with a vented backflow preventer for carbonated beverage dispensers.

603.4.14 Water Treatment Units. Reverse osmosis drinking water treatment units shall meet the requirements of the appropriate standards referenced in Table 14-1. Waste or discharge from reverse osmosis or other types of water treatment units shall enter the drainage system through an airgap.

603.4.15 Backflow preventers shall not be located in any area containing fumes that are toxic, poisonous, or corrosive.

603.4.16 Deck-mounted or equipment-mounted vacuum breakers shall be installed in accordance with their listing and the manufacturers' instructions, with the critical level not less than one (1) inch (25.4 mm) above the flood-level rim.

603.4.17 DELETED.

603.4.18 Protection from Fire Systems.

603.4.18.1 Except as provided under Sections 603.4.18.2 and 603.4.18.3, potable water supplies to fire protection systems that are normally under pressure, including but not limited to standpipes and automatic sprinkler systems, except in one- or two-family residential sprinkler systems, piped in materials approved for potable water distribution systems shall be protected from back-pressure and back-siphonage by one of the following testable devices:

- (1) Double check valve assembly
- (2) Double check detector assembly
- (3) Reduced pressure backflow preventer
- (4) Reduced pressure detector assembly

Potable water supplies to fire protection systems that are not normally under pressure shall be protected from backflow and shall meet the requirements of the appropriate standards referenced in Table 14-1.

603.4.18.2 Where fire protection systems supplied from a potable water system include a fire department (siamese) connection which is located less than seventeen hundred (1700) feet (518.2 m) from a non-potable water source that could be used by the fire department as a secondary water supply, the potable water supply shall be protected by one of the following:

- (1) Reduced pressure backflow preventer
- (2) Reduced pressure detector assembly

Note:

Non-potable water sources include fire department vehicles carrying water of

questionable quality or water that is treated with antifreeze, corrosion inhibitors, or extinguishing agents.

603.4.18.3 Where antifreeze, corrosion inhibitors, or other chemicals are added to a fire protection system supplied from a potable water supply, the potable water system shall be protected by one of the following:

- (1) Reduced pressure backflow preventer
- (2) Reduced pressure detector assembly

603.4.18.4 Whenever a backflow device is installed in the potable water supply to a fire protection system, the hydraulic design of the system shall account for the pressure drop through the backflow device. If such devices are retrofitted for an existing fire protection system, the hydraulics of the sprinkler system design shall be checked to verify that there will be sufficient water pressure available for satisfactory operation of the fire sprinklers.

603.4.18.5 Residential Sprinkler Systems.

When residential sprinkler systems are installed using the potable water system, they shall be installed in accordance with the standards listed in Table 14-1.

603.4.19 Special Equipment, Water Supply Protection. Vacuum breakers for washer-hose bedpans shall be located not less than five (5) feet (1524 mm) above the floor. Hose connections in health care or laboratory areas shall not be less than six (6) feet (1829 mm) above the floor.

603.4.20 Portable cleaning equipment, dental vacuum pumps, and chemical dispensers shall be protected from backflow by an airgap, an atmospheric vacuum breaker, a spill-proof vacuum breaker, or a reduced pressure principle backflow preventer.

603.4.21 Water Heater Connectors. Flexible metallic water heater connectors or reinforced flexible water heater connectors connecting water heaters to the piping system shall be in compliance with the appropriate standards listed in Table 14-1.

603.4.22 Combination stop-and-waste valves or cocks shall not be installed underground.

604.0 Materials.

604.1 Water distribution pipe, building supply water pipe, and fittings shall be of brass, copper, cast iron, CPVC, galvanized malleable iron, galvanized

wrought iron, galvanized steel, PEX, or other approved materials. Asbestos-cement, PE, PVC, PEX-AL-PEX, or PE-AL-PE water pipe manufactured to recognized standards may be used for cold water building supply distribution systems outside a building. PEX-AL-PEX water pipe, tubing, and fittings manufactured to recognized standards may be used for hot and cold water distribution systems within a building. PE-AL-PE water pipe and fittings may be used for cold water distribution systems within a building. All materials used in the water supply system, except valves and similar devices, shall be of a like material, except where otherwise approved by the Authority Having Jurisdiction.

604.2 Copper tube for water piping shall have a weight of not less than Type L.

Exception: Type M copper tubing may be used for water piping when piping is above ground in, or on, a building or underground outside of structures.

604.3 All hard-drawn copper tubing, in addition to the required incised marking, shall be marked in accordance with sections 19.3.1 and 19.3.2 of ASTM B 88-99 *Seamless Copper Water Tube*. The colors shall be: Type K, green; Type L, blue; Type M, red; Type DWV, yellow.

604.4 Listed flexible copper water connectors shall be installed in readily accessible locations, unless otherwise listed.

604.5 Cast iron fittings up to and including two (2) inches (51 mm) in size, when used in connection with potable water piping, shall be galvanized.

604.6 All malleable iron water fittings shall be galvanized.

604.7 Piping and tubing which has previously been used for any purpose other than for potable water systems shall not be used.

604.8 Approved plastic materials may be used in water service piping, provided that where metal water service piping is used for electrical grounding purposes, replacement piping therefor shall be of like materials.

Exception: Where a grounding system acceptable to the Authority Having Jurisdiction is installed, inspected, and approved, metallic pipe may be replaced with non-metallic pipe.

604.9 Solder shall conform to the requirements of Section 316.1.3.

604.10 Water pipe and fittings with a lead content which exceeds eight (8) percent shall be prohibited in piping systems used to convey potable water.

604.11 PEX. Cross-linked polyethylene (PEX) tubing shall be marked with the appropriate standard designation(s) listed in Table 14-1 for which the tubing

has been approved. PEX tubing shall be installed in compliance with the provisions of this section.

604.11.1 PEX Fittings. Metal insert fittings, metal compression fittings, and cold expansion fittings used with PEX tubing shall be manufactured to and marked in accordance with the standards for the fittings in Table 14-1.

604.11.2 Water Heater Connections. PEX tubing shall not be installed within the first eighteen (18) inches (457 mm) of piping connected to a water heater.

604.12 Flexible Corrugated Connectors. Flexible corrugated connectors of copper or stainless steel shall be limited to the following connector lengths:

Water Heater Connectors – twenty-four (24) inches (609 mm).

Fixture Connectors – thirty (30) inches (762 mm).

Washing Machine Connectors – seventy-two (72) inches (1827 mm).

Dishwasher and Icemaker Connectors – one hundred twenty (120) inches (3048 mm).

604.13 PEX-AL-PEX and PE-AL-PE. Crosslinked polyethylene-aluminum-crosslinked polyethylene (PEX-AL-PEX) and polyethylene-aluminum-polyethylene (PE-AL-PE) composite pipe shall be marked with the appropriate standard designations listed in Table 14-1 for which the piping has been listed or approved. PEX-AL-PEX and PE-AL-PE piping shall be installed in compliance with the provisions of this section.

604.13.1 PEX-AL-PEX and PE-AL-PE. Fittings used with PEX-AL-PEX and PE-AL-PE piping shall be manufactured to and marked in accordance with the standard for the fittings in Table 14-1.

604.13.2 Water Heater Connections. PEX-AL-PEX or PE-AL-PE tubing shall not be installed within the first eighteen inches (18) (457 mm) of piping connected to a water heater.

605.0 Valves.

605.1 Valves up to and including two (2) inches (51 mm) in size shall be brass or other approved material. Sizes over two (2) inches (51 mm) may have cast iron or brass bodies. Each gate or ball valve shall be a fullway type with working parts of noncorrosive material.

605.2 A fullway valve controlling all outlets shall be installed on the discharge side of each water meter and on each unmetered water supply. Water piping supplying more than one building on any one premises shall be equipped with a separate fullway valve to each

building, so arranged that the water supply can be turned on or off to any individual or separate building provided, however, that supply piping to a single-family residence and building accessory thereto, may be controlled on one valve. Such shutoff valves shall be accessible at all times. A fullway valve shall be installed on the discharge piping from water supply tanks at or near the tank. A fullway valve shall be installed on the cold-water supply pipe to each water heater at or near the water heater.

605.3 In multi-dwelling units, one (1) or more shutoff valves shall be provided in each dwelling unit so that the water supply to any plumbing fixture or group of fixtures in that dwelling unit can be shut off without stopping water supply to fixtures in other dwelling units. These valves shall be accessible in the dwelling unit that they control.

605.4 All valves used to control two (2) or more openings shall be fullway gate valves, ball valves, or other approved valves designed and approved for the service intended.

605.5 A control valve shall be installed immediately ahead of each water-supplied appliance and immediately ahead of each slip joint or appliance supply.

Parallel water distribution systems shall provide a control valve either immediately ahead of each fixture being supplied or installed at the manifold and shall be identified with the fixture being supplied.

605.6 All required shutoff or control valves shall be accessible.

605.7 A single control valve shall be installed on a water supply line ahead of any automatic metering valve which supplies a battery of fixtures.

606.0 Joints and Connections.

606.1 Types of Joints.

606.1.1 Flared Joints. Flared joints for soft copper water tubing shall be made with fittings meeting approved standards. The tubing shall be reamed to the full bore, resized to round, and expanded with a proper flaring tool.

606.1.2 Mechanical Joints. Mechanical joints for cast iron water pipe shall conform to nationally recognized standards.

606.1.3 Mechanically Formed Tee Fittings. 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 (3) times the thickness of the branch tube wall.

The branch tube shall be notched to conform

with the inner curve of the run tube and shall have two (2) dimple/depth stops to ensure 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. Dimple/depth stops shall be in line with the run of the tube. The second dimple shall be one quarter (1/4) inch (6.35 mm) above the first and shall serve as a visual point of inspection.

All joints shall be brazed in accordance with Section 316.1.7. Soft soldered joints shall not be allowed.

606.2 Use of Joints.

606.2.1 Copper Water Tube. Joints in copper tubing shall be made by the appropriate use of approved fittings properly soldered or brazed together as provided in Section 316.1.3 or 316.1.7 or by means of approved flared or compression fittings in Section 606.1.1 or 606.1.3. Solder and soldering flux shall conform to the requirements of Section 316.1.3. Mechanically formed tee fittings shall be made by brazing only and shall conform to the requirements of Section 316.1.7.

606.2.2 Plastic Fittings. Female PVC-screwed fittings for water piping shall be used with plastic male fittings and plastic male threads only.

606.2.3 Slip Joints. In water piping, slip joints may be used only on the exposed fixture supply.

607.0 Gravity Supply Tanks.

Gravity tanks for potable water shall be tightly covered, and have not less than a sixteen (16) square inch (10,323 mm²) overflow screened with copper screen having not less than fourteen (14) nor more than eighteen (18) openings per linear inch (25.4 mm).

608.0 Water Pressure, Pressure Regulators, Pressure Relief Valves, and Vacuum Relief Valves.

608.1 Inadequate Water Pressure. Whenever the water pressure in the main or other source of supply will not provide a residual water pressure of at least fifteen (15) pounds per square inch (103.4 kPa), after allowing for friction and other pressure losses, a tank and a pump or other means which will provide said fifteen (15) pound (103.4 kPa) pressure shall be installed. Whenever fixtures and/or fixture fittings are installed that require residual pressure higher than fifteen (15) pounds per square inch (103.4 kPa), that minimum residual pressure shall be provided.

608.2 Excessive Water Pressure. Where local static water pressure is in excess of eighty (80) pounds per square inch (552 kPa), an approved type

pressure regulator preceded by an adequate strainer shall be installed and the static pressure reduced to eighty (80) pounds per square inch (552 kPa) or less. For potable water services up to and including one and one-half (1-1/2) inch (40 mm) regulators, provision shall be made to prevent pressure on the building side of the regulator from exceeding main supply pressure. Approved regulators with integral bypasses shall be acceptable. Each such regulator and strainer shall be accessibly located and shall have the strainer readily accessible for cleaning without removing the regulator or strainer body or disconnecting the supply piping. All pipe size determinations shall be based on eighty (80) percent of the reduced pressure when using Table 6-5.

608.3 Any water system provided with a check valve, backflow preventer, or a pressure-regulating device which does not have a bypass feature at its source shall be provided with an approved, listed adequately sized pressure relief valve or a means to control expansion.

Any water system containing storage water heating equipment shall be provided with an approved, listed adequately sized combination pressure and temperature relief valve, except for listed non-storage instantaneous heaters having an inside diameter of not more than three (3) inches (80 mm). Each such approved combination temperature and pressure relief valve shall be installed on the water-heating device in an approved location based on its listing requirements and the manufacturer's instructions. Each such combination temperature and pressure relief valve shall be provided with a drain as required in Section 608.5.

In addition to the required pressure or combination pressure and temperature relief valve, an approved, listed expansion tank or other device designed for intermittent operation for thermal expansion control shall be installed whenever the building supply pressure is greater than the required relief valve pressure setting or when any device is installed that prevents pressure relief through the building supply. The tank or device shall be sized in accordance with the manufacturer's recommendation.

608.4 Each pressure relief valve shall be an approved automatic type with drain, and each such relief valve shall be set at a pressure of not more than one hundred fifty (150) pounds per square inch (1035 kPa). No shutoff valve shall be installed between the relief valve and the system or in the drain line.

608.5 Relief valves shall be provided with a full-sized drain, not smaller than the relief valve outlet, of galvanized steel or hard drawn copper, CPVC piping and fittings and shall extend from the valve to

a discharge location which will avoid the hazard to persons or damage to property. Discharge locations outside of the building shall be not less than 6 inches (152 mm) above the ground or the flood level of the area receiving the discharge, and shall not terminate between 2 feet (610 mm) and 16 feet (4880 mm) above the ground or above any other area where persons may normally be present. No valve shall be installed on the discharge side of any relief valve. The termination end of the drain pipe shall not be threaded and no part of such drain pipe shall be trapped.

Other approved locations shall include:

- (1) To a water heater drip pan of approved design, provided the pan is drained with pipe and fittings of the same size and material as required for the relief valve or with PVC Schedule 40 pipe and fittings.
- (2) To an approved, properly installed clothes washer standpipe receptor, laundry tray, floor drain, floor sink, hub drain, area drain or catch basin.
- (3) On grade concrete garage floors.
- (4) Other locations meeting the requirements of this section or as approved by the Authority Having Jurisdiction.

Note: There shall be no requirement to provide the pan or fixtures described in 1. or 2. above only for the purpose of receiving discharge from a relief valve.

608.6 Any water-heating device connected to a separate storage tank and having valves between said heater and tank shall be provided with an approved water pressure relief valve.

608.7 Vacuum Relief Valves. Where a hot-water storage tank or an indirect water heater is located at an elevation above the fixture outlets in the hot-water system, a vacuum relief valve shall be installed on the storage tank or heater.

609.0 Installation, Testing, Unions, and Location.

609.1 Installation. All water piping shall be adequately supported in accordance with Section 314.0. Burred ends shall be reamed to the full bore of the pipe or tube. Changes in direction shall be made by the appropriate use of fittings, except that changes in direction in copper tubing may be made with bends, provided that such bends are made with bending equipment which does not deform or create a loss in the cross-sectional area of the tubing. Changes in direction are allowed with flexible pipe and tubing without fittings in accordance with the manufacturer's installation instructions. Provisions shall be made for expansion in hot-water piping. All

piping, equipment, appurtenances, and devices shall be installed in a workmanlike manner in conformity with the provisions and intent of the code. All water service yard piping shall be at least twelve (12) inches (305 mm.) below the average local frost depth. The minimum cover shall be twelve (12) inches (305 mm) below finish grade.

609.2 Water pipes shall not be run or laid in the same trench as building sewer or drainage piping constructed of clay or materials which are not approved for use within a building unless both of the following conditions are met:

609.2.1 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.

609.2.2 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 which are not approved for use within a building shall be laid a minimum of twelve (12) inches (305 mm) above the sewer or drain pipe.

609.3 Water piping installed within a building and in or under a concrete floor slab resting on the ground shall be installed in accordance with the following requirements:

609.3.1 Ferrous piping shall have a protective coating of an approved type, machine applied and conforming to recognized standards. Field wrapping shall provide equivalent protection and shall be restricted to those short sections and fittings necessarily stripped for threading. Zinc coating (galvanizing) shall not be deemed adequate protection for piping or fittings. Approved non-ferrous piping shall not be required to be wrapped.

609.3.2 Copper tubing shall be installed without joints where possible. Where joints are permitted, they shall be brazed, and fittings shall be wrought copper.

Note:

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

609.4 Testing. Upon completion of a section or of the entire hot and cold water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply. Except for plastic piping, a fifty (50) pound per square inch (344.5 kPa)

air pressure may be substituted for the water test. In either method of test, the piping shall withstand the test without leaking for a period of not less than fifteen (15) minutes.

609.5 Unions. Unions shall be installed in the water supply piping within twelve (12) inches (305 mm) of regulating equipment, water heating, conditioning tanks, and similar equipment which may require service by removal or replacement in a manner which will facilitate its ready removal.

609.6 Location. Except as provided in Section 609.7, no building supply shall be located in any lot other than the lot which is the site of the building or structure served by such building supply.

609.6.1 All nonmetallic water service yard piping shall have an electrically conductive tracer wire (18-gauge, insulated copper, or heavier, blue 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 each end left above the finished grade, and shall be clearly marked. One end of the wire shall be at the building end of the pipe, the other end shall terminate at the property line in the meter box, the curb valve casing, or be spliced into the serving utilities tracer wire, when present.

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

609.7.1 Provide access to connect a building supply to an available public water service when proper cause and legal easement not in violation of other requirements have been first established to the satisfaction of the Authority Having Jurisdiction.

609.7.2 Provide additional space for a building supply when proper cause, transfer of ownership, or change of boundary not in violation of other requirements have 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, which 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 a 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.

TABLE 6-4

Water Supply Fixture Units (WSFU) and Minimum Fixture Branch Pipe Sizes³

Inch	mm
1/2	15
3/4	20
1	25

Appliances, Appurtenances or Fixtures ²	Minimum Fixture Branch Pipe Size ⁴	Private	Public	Assembly ⁶
Bathtub or Combination Bath/Shower (fill)	1/2"	4.0	4.0	
3/4" Bathtub Fill Valve	3/4"	10.0	10.0	
Bidet	1/2"	1.0		
Clothes washer	1/2"	4.0	4.0	
Dental Unit, cuspidor	1/2"		1.0	
Dishwasher, domestic	1/2"	1.5	1.5	
Drinking Fountain or Watercooler	1/2"	0.5	0.5	0.75
Hose Bibb	1/2"	2.5	2.5	
Hose Bibb, each additional ⁵	1/2"	1.0	1.0	
Lavatory	1/2"	1.0	1.0	1.0
Lawn Sprinkler, each head ⁷		1.0	1.0	
Mobile Home, each (minimum)		12.0		
Sinks				
Bar	1/2"	1.0	2.0	
Clinic Faucet	1/2"		3.0	
Clinic Flushometer Valve				
with or without faucet	1"		8.0	
Kitchen, domestic	1/2"	1.5	1.5	
Laundry	1/2"	1.5	1.5	
Service or Mop Basin	1/2"	1.5	3.0	
Washup, each set of faucets	1/2"		2.0	
Shower, per head	1/2"	2.0	2.0	
Urinal, 1.0 GPF Flushometer Valve	3/4"	See Footnote ⁷		
Urinal, greater than 1.0 GPF Flushometer Valve	3/4"	See Footnote ⁷		
Urinal, flush tank	1/2"	2.0	2.0	3.0
Washfountain, circular spray	3/4"		4.0	
Water Closet, 1.6 GPF Gravity Tank	1/2"	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Tank	1/2"	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Valve	1"	See Footnote ⁷		
Water Closet, greater than 1.6 GPF Gravity Tank	1/2"	3.0	5.5	7.0
Water Closet, greater than 1.6 GPF Flushometer Valve	1"	See Footnote ⁷		

Notes:

- ¹ Size of the cold branch pipe, or both the hot and cold branch pipes.
- ² Appliances, Appurtenances or Fixtures not included in this Table may be sized by reference to fixtures having a similar flow rate and frequency of use.
- ³ The listed fixture unit values represent their load on their cold water service. The separate cold water and hot water fixture unit value for fixtures having both hot and cold water connections may each be taken as three-quarter (3/4) of the listed total value of the fixture.
- ⁴ The listed minimum supply branch pipe sizes for individual fixtures are the nominal (I.D.) pipe size.
- ⁵ For fixtures or supply connections likely to impose continuous flow demands, determine the required flow in gallons per minute (GPM) and add it separately to the demand (in GPM) for the distribution system or portions thereof.
- ⁶ Assembly [Public Use (See Table 4-1)].
- ⁷ When sizing flushometer systems see Section 610.10.
- ⁸ Reduced fixture unit loading for additional hose bibbs as used is to be used only when sizing total building demand and for pipe sizing when more than one hose bibb is supplied by a segment of water distributing pipe. The fixture branch to each hose bibb shall be sized on the basis of 2.5 fixture units.

TABLE 6-5
Fixture Unit Table for Determining Water Pipe and Meter Sizes

Inch	mm
1/2	15
3/4	20
1	25
1-1/4	32
1-1/2	40
2	50
2-1/2	65

Pressure Range – 30 to 45 psi (207 to 310 kPa)**

Meter and Street Service, Inches	Building Supply and Branches, Inches	40 (12)	60 (18)	80 (24)	100 (30)	150 (46)	200 (61)	250 (76)	300 (91)	400 (122)	500 (152)	600 (183)	700 (213)	800 (244)	900 (274)	1000 (305)
3/4	1/2***	6	5	4	3	2	1	1	1	0	0	0	0	0	0	0
3/4	3/4	16	16	14	12	9	6	5	5	4	4	3	2	2	2	1
3/4	1	29	25	23	21	17	15	13	12	10	8	6	6	6	6	6
1	1	36	31	27	25	20	17	15	13	12	10	8	6	6	6	6
3/4	1-1/4	36	33	31	28	24	23	21	19	17	16	13	12	12	11	11
1	1-1/4	54	47	42	38	32	28	25	23	19	17	14	12	12	11	11
1-1/2	1-1/4	78	68	57	48	38	32	28	25	21	18	15	12	12	11	11
1	1-1/2	85	84	79	65	56	48	43	38	32	28	26	22	21	20	20
1-1/2	1-1/2	150	124	105	91	70	57	49	45	36	31	26	23	21	20	20
2	1-1/2	151	129	129	110	80	64	53	46	38	32	27	23	21	20	20
1	2	85	85	85	85	85	85	82	80	66	61	57	52	49	46	43
1-1/2	2	220	205	190	176	155	138	127	120	104	85	70	61	57	54	51
2	2	370	327	292	265	217	185	164	147	124	96	70	61	57	54	51
2	2-1/2	445	418	390	370	330	300	280	265	240	220	198	175	158	143	133

Pressure Range – 46 to 60 psi (317 to 414 kPa)**

3/4	1/2***	7	7	6	5	4	3	2	2	1	1	1	0	0	0	0
3/4	3/4	20	20	19	17	14	11	9	8	6	5	4	4	3	3	3
3/4	1	39	39	36	33	28	23	21	19	17	14	12	10	9	8	8
1	1	39	39	39	36	30	25	23	20	18	15	12	10	9	8	8
3/4	1-1/4	39	39	39	39	39	39	34	32	27	25	22	19	19	17	16
1	1-1/4	78	78	76	67	52	44	39	36	30	27	24	20	19	17	16
1-1/2	1-1/4	78	78	78	78	66	52	44	39	33	29	24	20	19	17	16
1	1-1/2	85	85	85	85	85	85	80	67	55	49	41	37	34	32	30
1-1/2	1-1/2	151	151	151	151	128	105	90	78	62	52	42	38	35	32	30
2	1-1/2	151	151	151	151	150	117	98	84	67	55	42	38	35	32	30
1	2	85	85	85	85	85	85	85	85	85	85	85	85	85	83	80
1-1/2	2	370	370	340	318	272	240	220	198	170	150	135	123	110	102	94
2	2	370	370	370	370	368	318	280	250	205	165	142	123	110	102	94
2	2-1/2	654	640	610	580	535	500	470	440	400	365	335	315	285	267	250

Pressure Range – Over 60 psi (414 kPa)**

3/4	1/2***	7	7	7	6	5	4	3	3	2	1	1	1	1	1	0
3/4	3/4	20	20	20	20	17	13	11	10	8	7	6	6	5	4	4
3/4	1	39	39	39	39	35	30	27	24	21	17	14	13	12	12	11
1	1	39	39	39	39	38	32	29	26	22	18	14	13	12	12	11
3/4	1-1/4	39	39	39	39	39	39	39	39	34	28	26	25	23	22	21
1	1-1/4	78	78	78	78	74	62	53	47	39	31	26	25	23	22	21
1-1/2	1-1/4	78	78	78	78	78	74	65	54	43	34	26	25	23	22	21
1	1-1/2	85	85	85	85	85	85	85	85	81	64	51	48	46	43	40
1-1/2	1-1/2	151	151	151	151	151	151	130	113	88	73	51	51	46	43	40
2	1-1/2	151	151	151	151	151	151	142	122	98	82	64	51	46	43	40
1	2	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
1-1/2	2	370	370	370	370	360	335	305	282	244	212	187	172	153	141	129
2	2	370	370	370	370	370	370	370	340	288	245	204	172	153	141	129
2	2-1/2	654	654	654	654	654	650	610	570	510	460	430	404	380	356	329

**Available static pressure after head loss.

***Building supply, three-quarter (3/4) inch (20 mm) nominal size minimum.

Table 6-6
Minimum Required Air Chamber Dimensions

Nominal Pipe Diameter	Length of Pipe (ft.)	Flow Pressure P.S.I.G.	Velocity in Ft. Per. Sec.	Required Vol. in Cubic Inch	Air Chamber Phys. Size in Inches
1/2" (15 mm)	25	30	10	8	3/4" x 15"
1/2" (15 mm)	100	60	10	60	1" x 69.5"
3/4" (20 mm)	50	60	5	13	1" x 15"
3/4" (20 mm)	200	30	10	108	1.25" x 72.5"
1" (25 mm)	100	60	5	19	1.25" x 12.7"
1" (25 mm)	50	30	10	40	1.25" x 27"
1-1/4" (32 mm)	50	60	10	110	1.25" x 54"
1-1/2" (40 mm)	200	30	5	90	2" x 27"
1-1/2" (40 mm)	50	60	10	170	2" x 50.5"
2" (50 mm)	100	30	10	329	3" x 44.5"
2" (50 mm)	25	60	10	150	2.5" x 31"
2" (50 mm)	200	60	5	300	3" x 40.5"

609.8 Low Pressure Cutoff Required on Booster Pumps for Water Distribution Systems. When a booster pump - excluding a fire pump - is connected to a water service or underground water pipe, a low-pressure cutoff switch on the inlet side of the pump shall be installed within five (5) feet (1524 mm) of the inlet. The cutoff switch shall be set for not less than ten (10) psi (68.9 kPa) or as required by the Authority Having Jurisdiction. A pressure gauge shall be installed between the shutoff valve and the pump.

609.9 Disinfection of Potable Water System. New or repaired potable water systems shall be disinfected prior to use whenever required by the Authority Having Jurisdiction. The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:

609.9.1 The pipe system shall be flushed with clean, potable water until only potable water appears at the points of outlet.

609.9.2 The system or parts thereof shall be filled with a water-chlorine solution containing at least fifty (50) parts per million of chlorine, and the system or part thereof shall be valved-off and allowed to stand for twenty-four (24) hours; or, the system or part thereof shall be filled with a water-chlorine solution containing at least two hundred (200) parts per million of chlorine and allowed to stand for three (3) hours.

609.9.3 Following the allowed standing time, the system shall be flushed with clean, potable water until the chlorine residual in the water coming from the system does not exceed the chlorine residual in the flushing water.

609.9.4 The procedure shall be repeated if it is

shown by bacteriological examination made by an approved agency that contamination persists in the system.

609.10 Water Hammer. All building water supply systems in which quick-acting valves are installed shall be provided with devices to absorb the hammer caused by high pressures resulting from the quick closing of these valves. These pressure-absorbing devices shall be either air chambers or approved mechanical devices. Water pressure absorbing devices shall be installed as close as possible to quick-acting valves.

609.10.1 Air Chambers. When air chambers are installed, they shall be in an accessible place, and each air chamber shall be provided with an accessible means for restoring the air in the event that the chamber becomes waterlogged. Air chambers shall be sized in accordance with Table 6-6.

609.10.2 Mechanical Devices. When listed mechanical devices are used, the manufacturer's specifications as to location and method of installation shall be followed. Such mechanical devices shall be accessible.

610.0 Size of Potable Water Piping.

610.1 The size of each water meter and each potable water supply pipe from the meter or other source of supply to the fixture supply branches, risers, fixtures, connections, outlets, or other uses shall be based on the total demand and shall be determined according to the methods and procedures outlined in this section. Other than systems sized by the use of Table 6-5, the system

shall be designed to assure that the maximum velocities allowed by the code and the applicable standard are not exceeded.

610.2 Whenever a water filter, water softener backflow prevention device, or similar device is installed in any water supply line, the pressure loss through such devices shall be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for any such pressure loss.

No water filter, water softener, backflow prevention device, or similar device regulated by this code shall be installed in any potable water supply piping when the installation of such device produces an excessive pressure drop in any such water supply piping. In the absence of specific pressure drop information, the diameter of the inlet or outlet of any such device or its connecting piping shall not be less than the diameter of such water distribution piping to the fixtures served by the device.

All such devices shall be of a type approved by the Authority Having Jurisdiction and shall be tested for flow rating and pressure loss by an approved laboratory or recognized testing agency to standards consistent with the intent of this chapter.

610.3 The quantity of water required to be supplied to every plumbing fixture shall be represented by fixture units, as shown in Table 6-4. Equivalent fixture values shown in Table 6-4 include both hot and cold water demand.

610.4 Systems within the range of Table 6-5 may be sized from that table or by the method set forth in Section 610.5.

Listed parallel water distribution systems shall be installed in accordance with their listing, but at no time shall any portion of the system exceed the maximum velocities allowed by the code.

610.5 Except as provided in Section 610.4, the size of each water piping system shall be determined in accordance with the procedure set forth in Appendix A. For alternate methods of sizing water supply systems.

610.6 Except where the type of pipe used and the water characteristics are such that no decrease in capacity due to length of service (age of system) may be expected, all friction loss data shall be obtained from the "Fairly Rough" or "Rough" charts in Appendix A of this code. Friction or pressure losses in water meter, valve and fittings shall be obtained from the same sources. Pressure losses through water treating equipment, backflow prevention devices, or other flow-restricting devices shall be computed as required by Section 610.2.

610.7 On any proposed water piping installation

sized using Table 6-5, the following conditions shall be determined:

- (1) Total number of fixture units as determined from Table 6-4, Equivalent Fixture Units, for the fixtures to be installed.
- (2) Developed length of supply pipe from meter to most remote outlet.
- (3) Difference in elevation between the meter or other source of supply and the highest fixture or outlet.
- (4) Pressure in the street main or other source of supply at the locality where the installation is to be made.
- (5) In localities where there is a fluctuation of pressure in the main throughout the day, the water piping system shall be designed on the basis of the minimum pressure available.

Table 6-7
Flushometer Fixture Units for Water Sizing Using Table 6-5

Fixture Category: Water Closet w/ Flushometer Valves

Number of Flushometer Valves	Individual Fixture Units Assigned in Decreasing Value	Fixture Units Assigned for Water Closets and Similar 10 Unit Fixtures in Accumulative Values
1	40	40
2	30	70
3	20	90
4	15	105
5 or more	10 each	115 plus 10 for each additional fixture in excess of 5

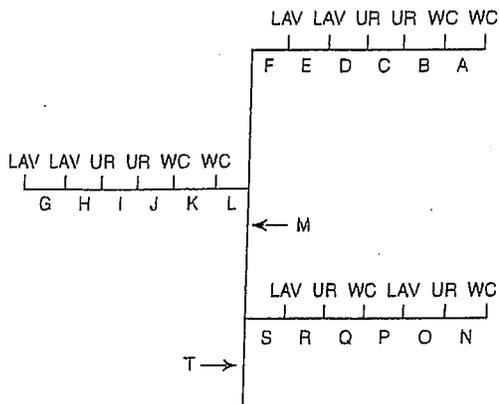
Fixture Category: Urinals w/ Flushometer Valves

Number of Flushometer Valves	Individual Fixture Units Assigned in Decreasing Value	Fixture Units Assigned for Urinals and Similar 5 Unit Fixtures in Accumulative Values
1	20	20
2	15	35
3	10	45
4	8	53
5 or more	5 each	58 plus 5 for each additional fixture in excess of 5

610.8 Size of Meter and Building Supply Pipe Using Table 6-5. The size of the meter and the building supply pipe shall be determined as follows:

- (1) Determine the available pressure at the water meter or other source of supply;

Sizing Method
Example Using TABLE 6-7
Public Use Fixtures



- (2) Subtract one-half (1/2) pound per square inch pressure (3.4 kPa) for each foot (305 mm) of difference in elevation between such source of supply and highest water supply outlet in the building or on the premises;
- (3) Use the "pressure range" group within which this pressure will fall using Table 6-5;
- (4) Select the "length" column which is equal to or longer than the required length;
- (5) Follow down the column to a fixture unit value equal to or greater than the total number of fixture units required by the installation;
- (6) Having located the proper fixture unit value for the required length, sizes of meter and building supply pipe as found in the two left-hand columns shall be applied.

No building supply pipe shall be less than three-quarter (3/4) inch (20 mm) in diameter.

610.9 Size of Branches. When Table 6-5 is used, the minimum size of each branch shall be determined by the number of fixture units to be served by that branch, the total developed length of the system, and the meter and street service size as per Section 610.8. No branch piping is required to be larger in size than that required by Table 6-5 for the building supply pipe.

610.10 Sizing for Flushometer Valves. When using Table 6-5 to size water supply systems serving flushometer valves, the number of flushometer fixture units assigned to every section of pipe, whether branch or main, shall be determined by the number and category of flushometer valves served by that section of pipe, in accordance with Table 6-7. Piping supplying a

flushometer valve shall not be less in size than the valve inlet.

When using Table 6-7 to size water piping, care must be exercised to assign flushometer fixture units based on the number and category of fixtures served. In the example above, fixture units assigned to each section of pipe are computed as follows: Note: Each capital letter refers to the section of pipe above it, unless otherwise shown.

- A: 1 WC = 40 F.U.
- B: 2 WC = 70 F.U.
- C: 2 WC (70) + 1 UR (20) = 90 F.U.
- D: 2 WC (70) + 2 UR (35) = 105 F.U.
- E: 2 WC (70) + 2 UR (35) + 1 LAV (1) = 106 F.U.
- F: 2 WC (70) + 2 UR (35) + 2 LAV (2) = 107 F.U.
- G: 1 LAV = 1 F.U.
- H: 2 LAV = 2 F.U.
- I: 2 LAV (2) + 1 UR (20) = 22 F.U.
- J: 2 LAV (2) + 2 UR (35) = 37 F.U.
- K: 2 LAV (2) + 2 UR (35) + 1 WC (40) = 77 F.U.
- L: 2 LAV (2) + 2 UR (35) + 2 WC (70) = 107 F.U.
- M: 4 WC (105) + 4 UR (53) + 4 LAV (4) = 162 F.U.
- N: 1 WC = 40 F.U.
- O: 1 WC (40) + 1 UR (20) = 60 F.U.
- P: 1 WC (40) + 1 UR (20) + 1 LAV (1) = 61 F.U.
- Q: 2 WC (70) + 1 UR (20) + 1 LAV (1) = 91 F.U.
- R: 2 WC (70) + 2 UR (35) + 1 LAV (1) = 106 F.U.
- S: 2 WC (70) + 2 UR (35) + 2 LAV (2) = 107 F.U.
- T: 6 WC (125) + 6 UR (63) + 6 LAV (6) = 194 F.U.

610.11 Sizing Systems for Flushometer Tanks.

The size of branches and mains serving flushometer tanks shall be consistent with the sizing procedures for flush tank water closets.

610.12 Sizing for Velocity. Water piping systems shall not exceed the maximum velocities listed in this section or Appendix A.

610.12.1 Copper Tube Systems. Maximum velocities in copper and copper alloy tube and fitting systems shall be limited to a maximum of eight (8) feet per second (fps) (2.4 mps) in cold water and five (5) fps in hot water (1.52 mps).

610.12.2 Tubing Systems Using Copper Alloy Fittings. Maximum velocities through copper alloy fittings in tubing other than copper shall be limited to a maximum of eight (8) feet per second (fps) (2.4 mps) in cold water and five (5) fps in hot water (1.52 mps).

610.13 Exceptions. The provisions of this section relative to size of water piping shall not apply to the following:

- (1) Water supply piping systems designed in accordance with recognized engineering procedures acceptable to the Authority Having Jurisdiction.
- (2) Alteration of or minor additions to existing installations, provided the Authority Having Jurisdiction finds that there will be an adequate supply of water to operate all fixtures.
- (3) Replacement of existing fixtures or appliances.
- (4) Piping which is part of fixture equipment.
- (5) Unusual conditions where, in the judgment of the Authority Having Jurisdiction, an adequate supply of water is provided to operate fixtures and equipment.
- (6) Non-potable water lines as defined in Sections 601.2.2 and 601.2.3.
- (7) The size and material of irrigation water piping installed outside of any building or structure and separated from the potable water supply by means of an approved airgap or backflow prevention device is not regulated by this code. The potable water piping system supplying each such irrigation system shall be adequately sized as required elsewhere in this chapter to deliver the full connected demand of both the domestic use and the irrigation systems.

611.0 Drinking Water Treatment Units.

611.1 Compliance with Standard. Drinking water treatment units shall meet the requirements of the appropriate standard referenced in Table 14-1.

611.2 Airgap Discharge. Discharge from all drinking water treatment units shall enter the drainage system through an airgap or an airgap device which meets the requirements of the appropriate standards referenced in Table 14-1.

611.3 Connection Tubing. The tubing to and from drinking water treatment units shall be of a size and material as recommended by the manufacturer. The tubing shall comply with the requirements of the appropriate standards referenced in Table 14-1.

611.4 Sizing of Residential Softeners. Residential-use water softeners shall be sized per Table 6-8.

TABLE 6-8
Sizing of Residential Water Softeners

Required Size of Softener Connection	Number of Bathroom Groups Served ¹
3/4 in.	up to 2 ²
1 in.	up to 4 ³

¹ Installation of a kitchen sink and dishwasher, laundry tray, and automatic clothes washer permitted without additional size increase.

² An additional water closet and lavatory permitted.

³ Over four bathroom groups, the softener size shall be engineered for the specific installation.

See also Appendix A, Recommended Rules for Sizing the Water Supply System.