





2021 UPC With Washington
State Amendments – Part I
P08C-04I
8 hours

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2021 UPC With Washington State Amendments – Part I

Course No: P08C-04I - Course Credit: 8 Hours

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LEARNING OBJECTIVES

1. To learn about the Uniform Plumbing code
2. To learn about Washington State Amendments
3. To familiarize with the UPC's design and format
4. To summarize the changes and updates to the UPC 2021
5. To review key sections and tables in the UPC
6. To provide consumers with safe and sanitary plumbing systems
7. To provide uniform guidelines for installation, maintenance, and inspection
8. To ensure plumbing materials and methods meet reliability and longevity standards
9. To learn how to handle pipe leaks and plumbing repairs
10. To gain an overview of water supply systems and their insulation
11. To provide clear codes, terms and regulations for builders, inspectors, and plumbers to follow

CHAPTER 1 ADMINISTRATION

Chapter 1 regulates the application, enforcement, and administration of subsequent requirements of the code.

As well as establishing the scope of the code, this chapter is concerned with enforcing the requirements contained in the body of the code.

A plumbing code, as with any other code, is intended to be adopted as a legally enforceable document to safeguard health, safety, property and public welfare.

There are no significant changes in this chapter.

101.0 General

101.1 Title

- This document shall be known as the “Uniform Plumbing Code,” may be cited as such, and will be referred to herein as “this code.”

101.2 Scope

- The provisions of this code shall apply to the erection, installation, alteration, repair, relocation, replacement, addition to, use, or maintenance of plumbing systems within this jurisdiction.

101.3 Purpose

- This code is an ordinance providing minimum requirements and standards for the protection of the public health, safety, and welfare.

101.4 Unconstitutional

- Where a section, subsection, sentence, clause, or phrase of this code is, for a reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.
- The legislative body hereby declares that it would have passed this code, and each section, subsection, sentence, clause, or phrase thereof, irrespective of the fact that one or more sections, subsections, sentences, clauses, and phrases are declared unconstitutional.

101.5 Validity

- Where a provision of this code, or the application thereof to a person or circumstance, is held invalid, the remainder of the code, or the application of such provision to other persons or circumstances, shall not be affected thereby.

102.0 Applicability

102.3 Maintenance

- The plumbing and drainage system, both existing and new, of a premise under the Authority Having Jurisdiction shall be maintained in a sanitary and safe operating condition.
- Devices or safeguards required by this code shall be maintained in accordance with the code edition under which installed.
- The owner or the owner's designated agent shall be responsible for maintenance of plumbing systems.
- To determine compliance with this subsection, the Authority Having Jurisdiction shall be permitted to cause a plumbing system to be reinspected.

102.5 Health and Safety

- Where compliance with the provisions of this code fails to eliminate or alleviate a nuisance, or other dangerous or insanitary condition that involves health or safety hazards, the owner or the owner's agent shall install such additional plumbing and drainage facilities or shall make such repairs or alterations as ordered by the Authority Having Jurisdiction.

102.8 Appendices

- The provisions in the appendices are intended to supplement the requirements of this code and shall not be considered part of this code unless formally adopted as such.

103.0 Duties and Powers of the Authority Having Jurisdiction

103.1 General

- The Authority Having Jurisdiction shall be the Authority duly appointed to enforce this code. For such purposes, the Authority Having Jurisdiction shall have the powers of a law enforcement officer.
- The Authority Having Jurisdiction shall have the power to render interpretations of this code and to adopt and enforce rules and regulations supplemental to this code as deemed necessary in order to clarify the application of the provisions of this code.
- Such interpretations, rules, and regulations shall comply with the intent and purpose of this code.

- In accordance with the prescribed procedures and with the approval of the appointing authority, the Authority Having Jurisdiction shall be permitted to appoint a such number of technical officers, inspectors, and other employees as shall be authorized from time to time.
- The Authority Having Jurisdiction shall be permitted to deputize such inspectors or employees as necessary to carry out the functions of the code enforcement agency.
- The Authority Having Jurisdiction shall be permitted to request the assistance and cooperation of other officials of this jurisdiction so far as required in the discharge of the duties in accordance with this code or other pertinent law or ordinance.

103.2 Liability

- The Authority Having Jurisdiction charged with the enforcement of this code, acting in good faith and without malice in the discharge of the Authority Having Jurisdiction's duties, shall not thereby be rendered personally liable for damage that accrues to persons or property as a result of an act or by reason of an act or omission in the discharge of duties.
- A suit brought against the Authority Having Jurisdiction or employee because of such act or omission performed in the enforcement of provisions of this code shall be defended by legal counsel provided by this jurisdiction until final termination of such proceedings.

103.3 Applications and Permits.

The Authority Having Jurisdiction shall be permitted to require the submission of plans, specifications, drawings, and such other information in accordance with the Authority Having Jurisdiction, prior to the commencement of, and at a time during the progress of, work regulated by this code. The issuance of a permit upon construction documents shall not prevent the Authority Having Jurisdiction from thereafter requiring the correction of errors in said construction documents or from preventing construction operations being carried on thereunder where in violation of this code or of other pertinent ordinance or from revoking a certificate of approval where issued in error.

103.3.1 Certification.

State rules and regulations concerning certification shall apply.

104.0 Permits

104.1 Permits Required

- It shall be unlawful for a person, firm, or corporation to make an installation, alteration, repair, replacement, or remodel a plumbing system regulated by this code except as permitted in Section 104.2, or to cause the same to be done without first obtaining a separate plumbing permit for each separate building or structure.

104.2 Exempt Work

- A permit shall not be required for the following:
 1. The stopping of leaks in drains, soil, waste, or vent pipe, provided, however, that a trap, drainpipe, soil, waste, or vent pipe become defective, and it becomes necessary to remove and replace the same with new material, the same shall be considered as new work and a permit shall be procured and inspection made as provided in this code.
 2. The clearing of stoppages, including the removal and reinstallation of water closets, or the repairing of leaks in pipes, valves, or fixtures, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.
- Exemption from the permit requirements of this code shall not be deemed to grant authorization for work to be done in violation of the provisions of the code or other laws or ordinances of this jurisdiction.

104.4 Permit Issuance

- The application, construction documents, and other data filed by an applicant for a permit shall be reviewed by the Authority Having Jurisdiction.
- Such plans shall be permitted to be reviewed by other departments of this jurisdiction to verify compliance with applicable laws under their jurisdiction.
- Where the Authority Having Jurisdiction finds that the work described in an application for permit and the plans, specifications, and other data filed therewith are in accordance with the requirements of the code and other pertinent laws and ordinances and that the fees specified in Section 104.5 have been paid, the Authority Having Jurisdiction shall issue a permit therefore to the applicant.

104.4.2 Validity of Permit

- The issuance of a permit or approval of construction documents shall not be construed to be a permit for, or an approval of, a violation of the provisions of this code or other ordinance of the jurisdiction.
- No permit presuming to give authority to violate or cancel the provisions of this code shall be valid.
- The issuance of a permit based upon plans, specifications, or other data shall not prevent the Authority Having Jurisdiction from thereafter requiring the correction of errors in said plans, specifications, and other data or from preventing building operations being carried on thereunder where in violation of this code or of other ordinances of this jurisdiction.



104.4.5 Suspension or Revocation

- The Authority Having Jurisdiction shall be permitted to, in writing, suspend or revoke a permit issued under the provisions of this code where the permit is issued in error or on the basis of incorrect information supplied or in violation of other ordinance or regulation of the jurisdiction.

104.4.6 Retention of Plans

- One set of approved construction documents and computations shall be retained by the Authority Having Jurisdiction until final approval of the work covered therein.
- One set of approved construction documents, computations, and manufacturer's installation instructions shall be returned to the applicant and said set shall be kept on the site of the building or work at times during which the work authorized thereby is in progress.

105.0 Inspections and Testing

105.1 General

- Plumbing systems for which a permit is required by this code shall be inspected by the Authority Having Jurisdiction.
- No plumbing system or portion thereof shall be covered, concealed, or put into use until inspected and approved as prescribed in this code.
- Neither the Authority Having Jurisdiction nor the jurisdiction shall be liable for expense entailed in the removal or replacement of material required to permit inspection.
- Plumbing systems regulated by this code shall not be connected to the water, the energy fuel supply, or the sewer system until authorized by the Authority Having Jurisdiction.

105.2 Required Inspections

- New plumbing work and such portions of existing systems as affected by new work, or changes, shall be inspected by the Authority Having Jurisdiction to ensure compliance with the requirements of this code and to ensure that the installation and construction of the plumbing system are in accordance with approved plans. The permittee or the permittee's authorized agent shall be responsible for the scheduling of such inspections as follows:
 - 1) The underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
 - 2) Rough-in inspection shall be made prior to the installation of wall or ceiling membranes.
 - 3) Final inspection shall be made upon completion of the installation.

105.2.1 Uncovering

- Where a drainage or plumbing system, building sewer, private sewage disposal system, or part thereof, which is installed, altered, or repaired, is covered or concealed before being inspected, tested, and approved as prescribed in this code, it shall be uncovered for inspection after notice to uncover the work has been issued to the responsible person by the Authority Having Jurisdiction.
- The requirements of this section shall not be considered to prohibit the operation of plumbing installed to replace existing equipment or fixtures serving an occupied portion of the building in the event a request for inspection of such equipment or fixture has been filed with the Authority Having Jurisdiction not more than 72 hours after such replacement work is completed.

105.2.1.1 Water Supply System

- No water supply system or portion thereof shall be covered or concealed until it first has been tested, inspected, and approved.

105.2.1.2 Covering or Using

- No plumbing or drainage system, building sewer, private sewer disposal system, or part thereof, shall be covered, concealed, or put into use until it has been tested, inspected, and accepted as prescribed in this code.

105.2.3 Inspection Requests

- It shall be the duty of the person doing the work authorized by a permit to notify the Authority Having Jurisdiction that such work is ready for inspection.
- The Authority Having Jurisdiction shall be permitted to require that a request for inspection be filed not less than 1 working day before such inspection is desired.
- Such request shall be permitted to be made in writing or by telephone, at the option of the Authority Having Jurisdiction.
- It shall be the duty of the person requesting inspections in accordance with this code to provide access to and means for inspection of such work.

105.2.4 Advance Notice

- It shall be the duty of the person doing the work authorized by the permit to notify the Authority Having Jurisdiction, orally or in writing that said work is ready for inspection.
- Such notification shall be given not less than 24 hours before the work is to be inspected.

105.2.5 Responsibility

- It shall be the duty of the holder of a permit to make sure that the work will stand the test prescribed before giving the notification.
- The equipment, material, and labor necessary for inspection or tests shall be furnished by the person to whom the permit is issued or by whom inspection is requested.

105.2.6 Reinspections

- A reinspection fee shall be permitted to be assessed for each inspection or reinspection where such portion of work for which inspection is called is not complete or where required corrections have not been made.
- Reinspection fees shall be permitted to be assessed where the approved plans are not readily available to the inspector, for failure to provide access on the date for which the inspection is requested, or for deviating from plans requiring the approval of the Authority Having Jurisdiction.
- To obtain reinspection, the applicant shall file an application therefore in writing upon a form furnished for that purpose and pay the reinspection fee.
- In instances where reinspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

105.3 Testing of Systems

- Plumbing systems shall be tested and approved in accordance with this code or the Authority Having Jurisdiction. Tests shall be conducted in the presence of the Authority Having Jurisdiction or the Authority Having Jurisdiction's duly appointed representative.
- No test or inspection shall be required where a plumbing system, or part thereof, is set up for exhibition purposes and has no connection with a water or drainage system.
- In cases where it would be impractical to provide the required water or air tests, or for minor installations and repairs, the Authority Having Jurisdiction shall be permitted to make such inspection as deemed advisable in order to be assured that the work has been performed in accordance with the intent of this code.
- Joints and connections in the plumbing system shall be gastight and watertight for the pressures required by the test.

105.3.1 Defective Systems

- An air test shall be used in testing the sanitary condition of the drainage or plumbing system of building premises where there is reason to believe that it has become defective. In buildings or premises condemned by the Authority Having Jurisdiction because of an insanitary condition of the plumbing system, or part thereof, the alterations in such system shall be in accordance with the requirements of this code.

105.3.2 Retesting

- Where the Authority Having Jurisdiction finds that the work will not pass the test, necessary corrections shall be made, and the work shall be resubmitted for test or inspection.

105.3.3 Approval

- Where prescribed tests and inspections indicate that the work is in accordance with this code, a certificate of approval shall be issued by the Authority Having Jurisdiction to the permittee on demand.

105.4 Connection to Service Utilities

- No person shall make connections from a source of energy or fuel to a plumbing system or equipment regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction.
- No person shall make connection from a water-supply line nor shall connect to a sewer system regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction.
- The Authority Having Jurisdiction shall be permitted to authorize temporary connection of the plumbing equipment to the source of energy or fuel for the purpose of testing the equipment.

106.0 Violations and Penalties

106.1 General

- It shall be unlawful for a person, firm, or corporation to erect, construct, enlarge, alter, repair, move, improve, remove, convert, demolish, equip, use, or maintain plumbing or permit the same to be done in violation of this code.

106.2 Notices of Correction or Violation

- Notices of correction or violation shall be written by the Authority Having Jurisdiction and shall be permitted to be posted at the site of the work or mailed or delivered to the permittee or their authorized representative.
- Refusal, failure, or neglect to comply with such notice or order within 10 days of receipt thereof, shall be considered a violation of this code and shall be subject to the penalties set forth by the governing laws of the jurisdiction.

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CHAPTER 2 DEFINITIONS

To maintain consistency and encourage the use of common terminology, Chapter 2 establishes definitions to provide clarity of terms and promote the use of a common language throughout the code.

Understanding definitions within the context of their application enables greater collaboration, efficiency, standardization and interpretation in applying and enforcing terms used throughout the code.

Codes are technical documents, and every term can impact the meaning of the code text. Terms not defined have a normally accepted meaning.

Definitions:

- **Accessible:** Where 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.
- **Appliance:** A device that utilizes an energy source to produce light, heat, power, refrigeration, air conditioning, or compressed fuel gas. This definition also shall include a vented decorative appliance.
- **Appliance, Low-Heat:** A fuel-burning appliance that produces a continuous flue gas temperature, at the point of entrance to the flue, of not more than 1000°F (538°C).
- **Appliance, Medium-Heat:** A fuel-burning appliance that produces a continuous flue gas temperature, at the point of entrance to the flue, of more than 1000°F (538°C) and less than 2000°F (1093°C).

- **Backflow:** The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from sources other than its intended source.
- **Backwater Valve:** A device installed in a drainage system to prevent reverse flow.
- **Bottle Filling Station:** A plumbing fixture connected to the potable water distribution system and sanitary drainage system that is designed and intended for filling personal use drinking water bottles or containers not less than 10 inches (254 mm) in height. Such fixtures can be separate from or integral to a drinking fountain and can incorporate a water filter and a cooling system for chilling the drinking water.

- **Cesspool:** A lined excavation in the ground that 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.
- **Combination Thermostatic/Pressure Balancing Valve:** A mixing valve that senses outlet temperature and incoming hot and cold water pressure and compensates for fluctuations in incoming hot and cold water temperatures, pressures, or both to stabilize outlet temperatures.

Summary of changes from previous version

- **Circuit Vent: (Newly added)** The vent that connects to a horizontal drainage branch and vents two traps to a maximum of eight traps connected into a battery of fixtures.
- **Commercial Modular System: (Newly added)** A drinking water treatment unit system consisting of multiple components attached to a manifold, produced specifically for food service applications, and not intended for use in residential applications.
- **Emergency Floor Drain: (Newly added)** A floor drain that does not receive discharge from any fixture drain or indirect waste pipe, and serves to protect from damage where accidental spills, leaks or fixture backups occur.

- **Confined Space:** A room or space having a volume less than 50 cubic feet per 1000 British thermal units per hour (Btu/h) (4.83 m³/kW) of the aggregate input rating of all fuel-burning appliances installed in that space.
- **Critical Level:** The critical level (C-L or C/L) marking on a backflow prevention device or vacuum breaker is a point con-forming to approved standards and established by the testing laboratory (usually stamped on the device by the manufacturer) that determines the minimum elevation above the flood-level rim of the fixture or receptor served at which the device may be installed. Where a backflow prevention device does not bear a critical level marking, the bottom of the vacuum breaker, combination valve, or the bottom of such approved device shall constitute the critical level

- **Dead Leg:** A section of potable water pipe which contains water that has no flow or does not circulate.
- **Debris Excluder:** A device installed on the rainwater catchment conveyance system to prevent the accumulation of leaves, needles, or other debris in the system.
- **Design Flood Elevation:** The elevation of the “design flood,” including wave height, relative to the datum specified on the community’s legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation is the elevation of the highest existing grade of the building’s perimeter plus the depth number (in feet) specified on the flood hazard map.
- **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.

- **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) where the opening is not circular, the diameter of a circle of equivalent cross-sectional area. (This applies to an air gap).
- **Exam Room Sink:** A sink used in the patient exam room of a medical or dental office with a primary purpose of the washing of hands.

- **Emergency Floor Drain: (Newly added)** A floor drain that does not receive discharge from any fixture drain or indirect waste pipe, and serves to protect from damage where accidental spills, leaks or fixture backups occur.
- **Expansion Tank: (Newly added)** A vessel used to protect potable water systems from excessive pressure.



Figure 1: Expansion Tank

- **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:** The concentration of flammable constituents in the air that exceeds 25 percent of its lower flammability limit (LFL).
- **FOG Disposal System:** A grease interceptor that reduces nonpetroleum fats, oils, and grease (FOG) in the effluent by separation, mass, and volume reduction.

- **Gas Piping System:** An arrangement of gas piping or regulators after the point of delivery and each arrangement of gas piping serving a building, structure, or premises, whether individually metered or not.
- **Grade:** The slope or fall of a line of pipe in reference to a horizontal plane. In drainage, it is usually expressed as the fall in a fraction of an inch (mm) or percentage slope per foot (meter) length of pipe.
- **Gray Water:** Untreated wastewater that has not come into contact with toilet waste, kitchen sink waste, dishwasher waste or similarly contaminated sources. Gray water includes wastewater from bathtubs, showers, lavatories, clothes washers, and laundry tubs. Also known as grey water, graywater, and greywater.

- **Grease Interceptor:** A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oil, and greases (FOG) from a wastewater discharge.
- **Grease Removal Device (GRD):** A hydromechanical grease interceptor that automatically, mechanically removes non-petroleum fats, oils and grease (FOG) from the interceptor, the control of which are either automatic or manually initiated.

- **Low-Pressure Water Dispenser: (Newly added)** A terminal fitting located downstream of a pressure reducing valve that dispenses drinking hot water above 71°C (160°F) or cold water or both at a pressure of 105 kPa (15 psi) or less.
- **Group Wash Fixture: (Newly Added)** A lavatory that allows more than one person to utilize the fixture at the same time. The fixture has one or more drains and one or more faucets.

- **Horizontal Branch:** A drain pipe extending laterally from 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 the building drain.
- **Hydromechanical Grease Interceptor:** A plumbing appurtenance or appliance that is installed in a sanitary drainage system to intercept nonpetroleum fats, oil, and grease (FOG) from a wastewater discharge and is identified by flow rate, and separation and retention efficiency. The design incorporates air entrainment, hydromechanical separation, interior baffling, or barriers in combination or separately, and one of the following:
 - 1) External flow control, with an air intake (vent), directly connected.
 - 2) External flow control, without air intake (vent), directly connected.
 - 3) Without external flow control, directly connected.
 - 4) Without external flow control, indirectly connected.

- **Indirect Waste Pipe:** A pipe that does not connect directly to the drainage system but conveys liquid wastes by discharging into a plumbing fixture, interceptor, or receptacle that is directly connected to the drainage system.
- **Individual Vent:** A pipe installed to vent a fixture trap, and that connects with the vent system above the fixture served or terminates in the open air.
- **Industrial Waste:** Liquid or water-borne waste from industrial or commercial processes, except domestic sewage.

- **Joint, Brazed:** A joint obtained by joining of metal parts with alloys that melt at temperatures exceeding 840°F (449°C), but less than the melting temperature of the parts to be joined.
- **Joint, Compression:** A multipiece joint with cup-shaped threaded nuts that, when tightened, compress tapered sleeves so that they form a tight joint on the periphery of the tubing they connect.
- **Joint, Flanged:** One made by bolting together a pair of flanged ends.
- **Joint, Flared:** A metal-to-metal compression joint in which a conical spread is made on the end of a tube that is compressed by a flare nut against a mating flare.
- **Joint, Mechanical:** The general form for gas-tight or liquid-tight joints obtained by the joining of parts through a positive holding mechanical construction.

- **Liquefied Petroleum Gas (LP-Gas) Facilities:** Liquefied petroleum gas (LP-Gas) facilities include tanks, containers, container valves, regulating equipment, meters, appurtenances, or any combination thereof for the storage and supply of liquefied petroleum gas for a building, structure, or premises.
- **Premises Listed (Third-Party Certified):** Equipment or materials included in a list published by a listing agency (accredited conformity assessment body) that maintains periodic inspection of 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.
- **Low-Pressure Water Dispenser:** A terminal fitting located downstream of a pressure reducing valve that dispenses drinking hot water above 71°C (160°F) or cold water or both at a pressure of 105 kPa (15 psi) or less.

- **Macerating Toilet System:** A system comprised 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.
- **Mulch:** Organic materials, such as wood chips and fines, tree bark chips, and pine needles that are used in a mulch basin to conceal gray water outlets and permit the infiltration of gray water.
- **Mulch Basin:** A subsurface catchment area for gray water that is filled with mulch and of sufficient depth and volume to prevent ponding, surfacing, or runoff.

- **Patient Care Space:** Any space of a health care facility wherein patients are intended to be examined or treated.
 - **Category 1 Space:** Space in which failure of equipment or a system is likely to cause major injury or death of patients, staff, or visitors.
 - **Category 2 Space:** Space in which failure of equipment or a system is likely to cause minor injury to patients, staff, or visitors.
 - **Category 3 Space:** Space in which the failure of equipment or a system is not likely to cause injury to patients, staff, or visitors but can cause discomfort.
 - **Category 4 Space:** Space in which failure of equipment or a system is not likely to have a physical impact on patient care.

- **Penetration Firestop System:** A specific assemblage of field-assembled materials, or a factory-made device, which has been tested to a standard test method and, where installed properly on penetrating piping materials, is capable of maintaining the fire-resistance rating of assemblies penetrated.
- **Plumbing Appliance:** A special class of device or equipment that is intended to perform a special plumbing function. Its operation, control, or both 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 Vent:** A pipe provided to ventilate a plumbing system, to prevent trap siphonage and backpressure, or to equalize the air pressure within the drainage system.
- **Plumbing 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 backpressure.
- **Potable Water:** Water that is satisfactory for drinking, culinary, and domestic purposes and that meets the requirements of the Health Authority Having Jurisdiction.

- **Public Water System:** A system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of twenty-five individuals daily for at least 60 days per year.
- **Quick-Disconnect Device:** A hand-operated device that provides a means for connecting and disconnecting a hose to a water supply, and that is equipped with a means to shut off the water supply when the device is disconnected.
- **Quick-Disconnect Device (Fuel Gas):** A hand-operated device that provides a means for connecting and disconnecting an appliance or an appliance connector to a gas supply, and that is equipped with an automatic means to shut off the gas supply when the device is disconnected.

- **Rainwater Catchment System:** A system that utilizes the principal of collecting, storing, and using rainwater from a rooftop or other manmade, aboveground collection surface.
- **Reclaimed Water:** Nonpotable water provided by a water/wastewater utility that, as a result of tertiary treatment of domestic wastewater, meets requirements of the public health Authority Having Jurisdiction for its intended uses.
- **Remote Outlet:** Where 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.

- **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.



Figure 2: Roof Drain Design

- **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.
- **Service Piping:** The piping and equipment between the street gas main and the gas piping system inlet that is installed by, and is under the control and maintenance of, the serving gas supplier.

- **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.
- **Special Wastes:** Wastes that 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.
- **T Rating:** The time period that the penetration firestop system, including the penetrating item, limits the maximum temperature rise of 325°F (181°C) above its initial temperature through the penetration on the nonfire side, where tested in accordance with ASTM E814 or UL 1479.

- **Thermostatic (Temperature Control) Valve:** A mixing valve that 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, where properly vented, a liquid seal that will prevent the back passage of air without materially affecting the flow of sewage or wastewater through it.
- **Trap Arm:** Those portions 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.

- **Vacuum System-Level 1:** A system consisting of central vacuum-producing equipment with pressure and operating controls, shutoff valves, alarm warning systems, gauges, and a network of piping extending to and terminating with suit-able station inlets at locations where patient suction could be required.
- **Valve, Pressure-Relief:** A pressure-actuated valve held closed by a spring or other means and designed automatically to relieve pressure in excess of its setting.
- **Vented Flow Control Device:** A device installed upstream from the hydromechanical grease interceptor having an orifice that controls the rate of flow through the interceptor, and an air intake (vent) downstream from the orifice, which allows air to be drawn into the flow stream.

- **Water Heater or Hot Water Heating Boiler:** An appliance designed primarily to supply hot water for domestic or commercial purposes and equipped with automatic controls limiting water temperature to a maximum of 210°F (99°C).
- **Water Supply System:** The building supply pipe, the water distribution pipes, and the necessary connecting pipes, fit-tings, control valves, backflow prevention devices, and all appurtenances carrying or supplying potable water in or adjacent to the building or premises.
- **Wet Procedure Locations:** The area in a patient care space where a procedure is performed that is normally subject to wet conditions while patients are present, including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff.
- **Wet Vent:** A vent that also serves as a drain.

201.0 General

201.1 Applicability

- 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.

202.0 Definition of Terms

202.1 General

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

Definitions:

- **Accepted Engineering Practice:** That which conforms to technical or scientific-based principles, tests, or standards that are accepted by the engineering profession.
- **Air Break:** A physical separation which may be a low inlet into the indirect waste receptor from the fixture, appliance, or device indirectly connected.
- **Air Gap, Water Distribution:** The unobstructed vertical distance through the free atmosphere between the lowest opening from a pipe or faucet conveying potable water to the flood-level rim of a tank, vat, or fixture.

- **Appliance Categorized Vent Diameter/Area:** The minimum vent diameter/area permissible for Category I appliances to maintain a nonpositive vent static pressure when tested in accordance with nationally recognized standards.
- **Approved Testing Agency:** An organization primarily established for purposes of testing to approved standards and approved by the Authority Having Jurisdiction
- **Aspirator:** A fitting or device supplied with water or other fluid under positive pressure that passes through an integral orifice or constriction, causing a vacuum.

- **Backpressure Backflow:** Backflow due to an increased pressure above the supply pressure, which may be due to pumps, boilers, gravity, or other sources of pressure.
- **Battery of Fixtures:** A group of two or more similar, adjacent fixtures that discharge into a common horizontal waste or soil branch.
- **Bonding Conductor or Jumper:** A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected.

- **Building Sewer:** That part of the horizontal piping of a drainage system that extends from the end of the building drain and that receives the discharge of the building drain and conveys it to a public sewer, private sewer, private sewage disposal system, or another point of disposal.
- **Building Sewer (Combined):** A building sewer that conveys both sewage and storm water or other drainage.
- **Building Sewer (Sanitary):** A building sewer that conveys sewage only.
- **Building Sewer (Storm):** A building sewer that conveys storm water or another drainage, but no sewage. Building Subdrain. That portion of a drainage system that does not drain by gravity into the building sewer.

- **Category 1:** Activities, systems, or equipment whose failure is likely to cause major injury or death to patients, staff, or visitors.
- **Category 2:** Activities, systems, or equipment whose failure is likely to cause minor injury to patients, staff, or visitors.
- **Category 3:** Activities, systems, or equipment whose failure is not likely to cause injury to patients, staff, or visitors, but can cause discomfort.

- **Category 3 Vacuum System:** A Category 3 vacuum distribution system that can be either a wet system designed to remove liquids, air-gas, or solids from the treated area; or a dry system designed to trap liquid and solids before the service inlet and to accommodate air-gas only through the service inlet.
- **Category 4:** Activities, systems, or equipment whose failure would have no impact on patient care.
- **Certified Backflow Assembly Tester:** A person certified by the Washington state department of health under chapter 246-292 WAC to inspect (for correct installation and approval status) and test (for proper operation), maintain and repair (in compliance with chapter 18.106 RCW) backflow prevention assemblies, devices and air gaps.

- **Chimney, High-Heat Appliance-Type:** A factorybuilt, masonry, or metal chimney suitable for removing the products of combustion from fuel-burning high-heat appliances producing combustion gases in excess of 2000°F (1093°C), measured at the appliance flue outlet.
- **Chimney, Low-Heat Appliance-Type:** A factorybuilt, masonry, or metal chimney suitable for removing the products of combustion from fuel-burning low-heat appliances producing combustion gases not in excess of 1000°F (538°C) under normal operating conditions, but capable of producing combustion gases of 1400°F (760°C) during intermittent forced firing for periods up to one hour. Temperatures are measured at the appliance flue outlet.



Figure 2: Chimney

- **Construction Documents:** Plans, specifications, written, graphic, and pictorial documents prepared or assembled for describing the design, location, and physical characteristics of the elements of a project necessary for obtaining a permit.
- **Continuous Vent:** A vertical vent that is a continuation of the drain to which it connects.



Figure 3: Construction documents are necessary for obtaining work permits

- **Copper Alloy:** A homogenous mixture of two or more metals in which copper is the primary component, such as brass and bronze.
- **Critical Care Area:** See Patient Care Space, Category 1.
- **Cross-Connection:** A connection or arrangement, physical or otherwise, between a potable water supply system and a plumbing fixture or a tank, receptor, equipment, or device, through which it may be possible for nonpotable, used, unclean, polluted, and contaminated water, or other substances to enter into a part of such potable water system under any condition.

- **Drainage System:** Includes all the piping within public or private premises that conveys sewage, storm water, 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:** 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.

- **Effective Ground-Fault Current Path:** An intentionally constructed, low impedance electrically conductive path designed and intended to carry current under ground-fault conditions from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors.
- **Existing Work:** A plumbing system or any part thereof that has been installed prior to the effective date of this code.
- **Expansion Joint:** A fitting or arrangement of pipe and fittings that permit the contraction and expansion of a piping system.

- **Flood Hazard Area:** The greater of the following two areas:
 1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.
 2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.



Figure 4: Flood Hazard Area

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

- **Health Care Facility's Governing Body:** The person or persons who have the overall legal responsibility for the operation of a health care facility.
- **Heat-Fusion Weld Joints:** A joint used in some thermoplastic systems to connect the pipe to fittings or pipe lengths directly to one another (butt-fusion). This method of joining pipe to fittings includes socket-fusion, electro-fusion, and saddle-fusion. This method of welding involves the application of heat and pressure to the components, allowing them to fuse together forming a bond between the pipe and fitting.



Figure 5: Welding

- **Hot Water:** Water at a temperature exceeding or equal to 100°F.

- **Medical Gas:** A patient medical gas or medical support gas.
- **Nonwater Urinal with Drain Cleansing Action:** A nonwater urinal that conveys waste into the drainage system without the use of water for flushing and automatically performs a drain-cleansing action after a predetermined amount of time.
- **Plumbing System:** Includes all potable water, building supply and distribution pipes, all reclaimed or other alternate source water systems, all rainwater systems, all plumbing fixtures and traps, all drainage and vent pipe(s), and all building drains including their respective joints and connection, 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: Provided, that no certification shall be required for the installation of a plumbing system within the property lines and outside a building.

- **Spray Sprinkler Body:** The exterior case or shell of a sprinkler incorporating a means of connection to the piping system designed to convey water to a nozzle or orifice.

- **Vent Offset:** An arrangement of two or more fittings and pipe installed for the purpose of locating a vertical section of vent pipe in a different but parallel plane with respect to an adjacent section of vertical vent pipe.
- **Water-Conditioning or Treating Device:** A device that conditions or treats a water supply to change its chemical content or remove suspended solids by filtration.
- **Water Distribution Pipe:** In a building or premises, a pipe that conveys potable water from the building supply pipe to the plumbing fixtures and other water outlets.



Figure 6: Water Distribution Pipes

- **Water Heater (consumer electric storage):** A consumer product that uses electricity as the energy source to heat domestic potable water, has a nameplate input rating of twelve kilowatts or less, contains nominally forty gallons but no more than one hundred twenty gallons of rated hot water storage volume, and supplies a maximum hot water delivery temperature less than one hundred eighty degrees Fahrenheit.
 - **Water Heater (mini-tank electric):** A small electric water heater that has a measured storage volume of more than one gallon and a rated storage volume of less than twenty gallons.
 - **Water/Wastewater Utility:** A public or private entity, including a water purveyor as defined in chapter 246-290 WAC, which may treat, deliver, or do both functions to reclaimed (recycled) water, potable water, or both to wholesale or retail customers.

- **Whirlpool Bathtub:** A bathtub fixture equipped and fitted with a circulating piping system designed to accept, circulate, and discharge bathtub water upon each use.
- **Yoke Vent:** A pipe connecting upward from soil or waste stack to a vent stack to prevent pressure changes in the stacks.

- Please pause the presentation and watch the video.

CHAPTER 3 GENERAL REGULATIONS

Chapter 3 regulates the general requirements, not specific to other chapters, for installing plumbing systems. many regulations are not specific plumbing requirements, but relate to the overall plumbing system.

This chapter contains safety requirements for installing plumbing and also contains non-plumbing requirements for identifying pipe, pipe fittings, traps, fixtures, materials and devices used in plumbing systems.

Listing method of approval, based on applicable nationally recognized standards, for the safe and proper installation of plumbing systems is essential to ensure protection of public health, safety, and welfare.

There are no significant changes in this section.

301.0 General

301.1 Applicability

- This chapter shall govern the general requirements, not specific to other chapters, for the installation of plumbing systems.

301.2 Minimum Standards

- Pipe, pipe fittings, traps, fixtures, material, and devices used in a plumbing system shall be listed (third-party certified) by a listing agency (accredited conformity assessment body) as complying with the approved applicable recognized standards referenced in this code, and shall be free from defects.
- Unless otherwise provided for in this code, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof shall be submitted to the Authority Having Jurisdiction for approval prior to being installed.

301.2.2 Standards.

Standards listed or referred to in this chapter or other chapters cover materials which will conform to the requirements of this code, when used in accordance with the limitations imposed in this or other chapters thereof and their listing. Where a standard covers materials of various grades, weights, quality, or configurations, the portion of the listed standard that is applicable shall be used. Design and materials for special conditions or materials not provided for herein shall be permitted to be used by special permission of the authority having jurisdiction after the authority having jurisdiction has been satisfied as to their adequacy in accordance with Section 301.2.

301.2.4 Cast-Iron Soil Pipe, Fittings, and Hubless Couplings

- Cast-iron soil pipe, fittings, and hubless couplings shall be third party certified in accordance with ASTM C1277 and CISPI 310 for couplings and ASTM A888, ASTM A74, and CISPI 301 for pipes and fittings.

301.2.5 Existing Buildings

- In existing buildings or premises in which plumbing installations are to be altered, repaired, or renovated, the Authority Having Jurisdiction has discretionary powers to permit deviation from the provisions of this code, provided that such proposal to deviate is first submitted for proper determination in order that health and safety requirements, as they pertain to plumbing, shall be observed.

301.4 Flood Hazard Areas

- Plumbing systems shall be located above the elevation in accordance with the building code for utilities and attendant equipment or the elevation of the lowest floor, whichever is higher.



Figure 7: Flood Hazard Signs

301.4.1 Coastal High Hazard Areas

- Plumbing systems in buildings located in coastal high hazard areas shall be in accordance with the requirements of Section 301.4, and plumbing systems, pipes, and fixtures shall not be mounted on or penetrate through walls that are intended to breakaway under flood loads in accordance with the building code.

301.5 Alternative Engineered Design

- An alternative engineered design shall comply with the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, fire resistance, durability, and safety. Material, equipment, or components shall be designed and installed in accordance with the manufacturer's installation instructions.

301.5.2 Technical Data

- The registered design professional shall submit sufficient technical data to substantiate the proposed alternative engineered design and to prove that the performance meets the intent of this code.

302.0 Iron Pipe Size (IPS) Pipe

302.1 General

- Iron, steel, copper, and copper alloy pipe shall be standard-weight iron pipe size (IPS) pipe.

303.0 Disposal of Liquid Waste

303.1 General

- It shall be unlawful for a person to cause, suffer, or permit the disposal of sewage, human excrement, or other liquid wastes, in a place or manner, except through and by means of an approved drainage system, installed and maintained in accordance with the provisions of this code.

304.0 Connections to Plumbing System Required

304.1 General

- Plumbing fixtures, drains, appurtenances, and appliances, used to receive or discharge liquid wastes or sewage, shall be connected properly to the drainage system of the building or premises, in accordance with the requirements of this code.

305.0 Damage to Drainage System or Public Sewer

305.1 Unlawful Practices

- It shall be unlawful for a person to deposit, by any means whatsoever, into a plumbing fixture, floor drain, interceptor, sump, receptor, or device, which is connected to a drainage system, public sewer, private sewer, septic tank, or cesspool, any ashes; cinders; solids; rags; inflammable, poisonous, or explosive liquids or gases; oils; grease; or any other thing whatsoever that is capable of causing damage to the drainage system or public sewer.

306.0 Industrial Wastes

306.1 Detrimental Wastes

- Wastes detrimental to the public sewer system or detrimental to the functioning of the sewage treatment plant shall be treated and disposed of as found necessary and directed by the Authority Having Jurisdiction.

306.2 Safe Discharge

- Sewage or other waste from a plumbing system that is capable of being deleterious to surface or subsurface waters shall not be discharged into the ground or a waterway unless it has first been rendered safe by some acceptable form of treatment in accordance with the Authority Having Jurisdiction.

307.0 Location

307.1 System

- Except as otherwise provided in this code, no plumbing system, drainage system, building sewer, private sewage disposal system, or parts thereof shall be located in a lot other than the lot that is the site of the building, structure, or premises served by such facilities.

307.2 Ownership

- No subdivision, sale, or transfer of ownership of existing property shall be made in such manner that the area, clearance, and access requirements of this code are decreased.

308.0 Improper Location

308.1 General

- Piping, fixtures, or equipment shall not be so located as to interfere with the normal use thereof or with the normal operation and use of windows, doors, or other required facilities.

309.0 Workmanship

309.1 Engineering Practices

- Design, construction, and workmanship shall be in accordance with accepted engineering practices and shall be of such character as to secure the results sought to be obtained by this code.

309.2 Concealing Imperfections

- It is unlawful to conceal cracks, holes, or other imperfections in materials by welding, brazing, or soldering or by using therein or thereon paint, wax, tar, solvent cement, or other leak-sealing or repair agent.

309.3 Burred Ends

- Burred ends of pipe and tubing shall be reamed to the full bore of the pipe or tube, and chips shall be removed.

309.6 Dead Legs

- Dead legs shall have a method of flushing.

310.0 Prohibited Fittings and Practices

310.1 Fittings

- No double hub fitting, single or double tee branch, single or double tapped tee branch, side inlet quarter bend, running thread, band, or saddle shall be used as a drainage fitting, except that a double hub sanitary tapped tee shall be permitted to be used on a vertical line as a fixture connection.

310.2 Drainage and Vent Piping

- No drainage or vent piping shall be drilled and tapped for the purpose of making connections thereto, and no cast-iron soil pipe shall be threaded.

310.3 Waste Connection

- No waste connection shall be made to a closet bend or stub of a water closet or similar fixture.

310.4 Use of Vent and Waste Pipes

- Except as hereinafter provided in Sections 908.0 through 911.0 and Appendix C, no vent pipe shall be used as a soil or waste pipe, nor shall any soil or waste pipe be used as a vent.

310.5 Obstruction of Flow

- No fitting, fixture and piping connection, appliance, device, or method of installation that obstructs or retards the flow of water, wastes, sewage, or air in the drainage or venting systems, in an amount exceeding the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this code or is approved in accordance with Section 301.2 of this code.
- The enlargement of a 3-inch (80 mm) closet bend or stub to 4 inches (100 mm) shall not be considered an obstruction.

310.6 Dissimilar Metals.

- Except for necessary valves, where intermembering or mixing of dissimilar metals occurs, the point of connection shall be confined to exposed or accessible locations.

310.7 Direction of Flow

- Valves, pipes, and fittings shall be installed in correct relationship to the direction of flow.

310.8 Screwed Fittings

- Screwed fittings shall be ABS, cast-iron, copper, copper alloy, malleable iron, PVC, steel, or other approved materials. Threads shall be tapped out of solid metal or molded in solid ABS or PVC.

311.0 Independent Systems

311.1 General

- The drainage system of each new building and new work installed in an existing building shall be separate and independent from that of any other building, and, where available, every building shall have an independent connection with a public or private sewer.

312.0 Protection of Piping, Materials, and Structures

312.1 General

- Piping passing under or through walls shall be protected from breakage. Piping passing through or under cinders or other corrosive materials shall be protected from external corrosion in an approved manner.
- Approved provisions shall be made for expansion of hot water piping. Voids around piping passing through concrete floors on the ground shall be sealed.

312.2 Installation

- Piping in connection with a plumbing system shall be so installed that piping or connections will not be subject to undue strains or stresses, and provisions shall be made for expansion, contraction, and structural settlement. No plumbing piping shall be directly embedded in concrete or masonry. No structural member shall be seriously weakened or impaired by cutting, notching, or otherwise, as defined in the building code.

312.3 Building Sewer and Drainage Piping

- No building sewer or other drainage piping or part thereof, constructed of materials other than those approved for use under or within a building, shall be installed under or within 2 feet (610 mm) of a building or structure, or less than 1 foot (305 mm) below the surface of the ground.

312.4 Corrosion, Erosion, and Mechanical Damage

- Piping subject to corrosion, erosion, or mechanical damage shall be protected in an approved manner.

312.5 Protectively Coated Pipe

- Protectively coated pipe or tubing shall be inspected and tested, and a visible void, damage, or imperfection to the pipe coating shall be repaired in an approved manner.

312.6 Freezing Protection

- No water, soil, or waste pipe shall be installed or permitted outside of a building, in attics or crawl spaces, or in an exterior wall unless, where necessary, adequate provision is made to protect such pipe from freezing. All hot and cold-water pipes installed outside the conditioned space shall be insulated to meet the minimum requirements of the Washington State Energy Code.

312.7 Fire-Resistant Construction.

- All pipe penetrating floor/ceiling assemblies and fire-resistance rated walls or partitions shall be protected in accordance with the requirements of the building code.

312.8 Waterproofing of Openings.

- Joints at the roof around pipes, ducts, or other appurtenances shall be made watertight by the use of lead, copper, galvanized iron, or other approved flashings or flashing material. Exterior wall openings shall be made watertight.

312.9 Steel Nail Plates

- Plastic and copper or copper alloy piping penetrating framing members to within 1 inch (25.4 mm) of the exposed framing shall be protected by steel nail plates not less than No. 18 gauge (0.0478 inches) (1.2 mm) in thickness. The steel nail plate shall extend along the framing member not less than 1½ inches (38 mm) beyond the outside diameter of the pipe or tubing

312.10 Sleeves

- Sleeves shall be provided to protect piping through concrete and masonry walls, and concrete floors.

312.10.1 Building Loads

- Piping through concrete or masonry walls shall not be subject to a load from building construction.

312.10.2 Exterior Walls

- In exterior walls, annular space between sleeves and pipes shall be sealed and made watertight, as approved by the Authority Having Jurisdiction.

312.10.3 Firewalls

- A pipe sleeve through a firewall shall have space around the pipe completely sealed with an approved fire-resistive material in accordance with other codes

312.11 Structural Members

- A structural member weakened or impaired by cutting, notching, or otherwise shall be reinforced, repaired, or replaced so as to be left in a safe structural condition in accordance with the requirements of the building code.

312.12 Rodentproofing

- Strainer plates on drain inlets shall be designed and installed so that no opening exceeds $\frac{1}{2}$ of an inch (12.7 mm) in the least dimension.

312.12.1 Meter Boxes

- Meter boxes shall be constructed in such a manner as to restrict rodents or vermin from entering a building by following the service pipes from the box into the building.

312.12.2 Metal Collars

- In or on buildings where openings have been made in walls, floors, or ceilings for the passage of pipes, such openings shall be closed and protected by the installation of approved metal collars securely fastened to the adjoining structure.

312.12.3 Tub Waste Openings

- Tub waste openings in framed construction to crawl spaces at or below the first floor shall be protected by the installation of approved metal collars or metal screen securely fastened to the adjoining structure with no opening exceeding $\frac{1}{2}$ of an inch (12.7 mm) in the least dimension.

313.0 Hangers and Supports

313.1 General

- Piping, fixtures, appliances, and appurtenances shall be supported in accordance with this code, the manufacturer's installation instructions, and in accordance with the Authority Having Jurisdiction.

313.2 Material

- Hangers and anchors shall be of sufficient strength to support the weight of the pipe and its contents. Piping shall be isolated from incompatible materials.

313.4 Alignment

- Piping shall be supported in such a manner as to maintain its alignment and prevent sagging.

313.6 Hanger Rod Sizes

- Hanger rod sizes shall be not smaller than those shown in Table 313.6.

PIPE AND TUBE SIZE (inches)	ROD SIZE (inches)
$\frac{1}{2}$ – 4	$\frac{3}{8}$
5 – 8	$\frac{1}{2}$
10 – 12	$\frac{5}{8}$

Table 1: Hanger Rod Sizes

(Source: IAPMO/ANSI, UPC, 1 2021, table 313.6)

314.0 Trenching, Excavation, and Backfill

314.1 Trenches

- Trenches deeper than the footing of a building or structure, and paralleling the same, shall be located not less than 45 degrees (0.79 rad) from the bottom exterior edge of the footing, or as approved in accordance with Section 301.0.

314.2 Tunneling and Driving

- Tunneling and driving shall be permitted to be done in yards, courts, or driveways of a building site.
- Where sufficient depth is available to permit, tunnels shall be permitted to be used between open-cut trenches.
- Tunnels shall have a clear height of 2 feet (610 mm) above the pipe and shall be limited in length to one-half the depth of the trench, with a maximum length of 8 feet (2438 mm).
- Where pipes are driven, the drive pipe shall be not less than one size larger than the pipe to be laid.

314.3 Open Trenches

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

314.4 Excavations

- Excavations shall be completely back-filled as soon after inspection as practicable.
- Precaution shall be taken to ensure compactness of backfill around piping without damage to such piping.
- Trenches shall be backfilled in thin layers to 12 inches (305 mm) above the top of the piping with clean earth, which shall not contain stones, boulders, cinder fill, frozen earth, construction debris, or other materials that will damage or break the piping or cause corrosive action.
- Mechanical devices such as bulldozers, graders, etc., shall be permitted to be then used to complete backfill to grade.
- Fill shall be properly compacted. Precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

314.4.1 Installation of Thermoplastic Pipe and Fittings

- Trench width for thermoplastic sewer pipe shall be not less than 1.25 times the outside diameter of the piping plus 12 inches (305 mm) or the outside diameter of the piping plus not less than 16 inches (406 mm).
- Thermoplastic piping shall be bedded in not less than 4 inches (102 mm) of granular fill supporting the piping.
- The backfill for thermoplastic piping shall be compacted along the sides of the piping in 6-inch (152 mm) layers and continue to not less than 12 inches (305 mm) above the piping.
- Compaction shall be not less than an 85 percent standard proctor density.



Figure 4: Thermoplastic Pipes

315.0 Joints and Connections

315.1 Unions

- Approved unions shall be permitted to be used in drainage piping where accessibly located in the trap seal or between a fixture and its trap; in the vent system, except underground or in wet vents; at any point in the water supply system; and in gas piping.

315.2 Prohibited Joints and Connections

- A fitting or connection that has an enlargement, chamber, or recess with a ledge, shoulder, or reduction of pipe area that offers an obstruction to flow through the drain shall be prohibited.

316.0 Increases and Reducers

316.1 General

- Where different sizes of pipes and fittings are to be connected, the proper size increasers or reducers or reducing fittings shall be used between the two sizes. Copper alloy or cast-iron body cleanouts shall not be used as a reducer or adapter from cast-iron drainage pipe to iron pipe size (IPS) pipe.

- Please pause the presentation and watch the video.

CHAPTER 4 PLUMBING FIXTURES AND FIXTURE FITTINGS

This chapter regulates the minimum number of plumbing fixtures of a specific type and quality for each building. the fixtures must be properly installed to be usable by the individuals occupying the building.

The quality and design of every fixture must conform to the applicable referenced standard. compliance with this chapter will result in a building or structure having acceptable plumbing fixtures for the sanitary, hygienic, cleaning, washing and food preparation needs of the occupants.

(2018)

407.1 Application:

- Lavatories shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, ASME A112.19.12, CSA B45.5/IAPMO Z124, CSA B45.8/IAPMO Z403, CSA B45.11/IAPMO Z401 or CSA B45.12/IAPMO Z402.

(2021)

407.1 Application:

- Lavatories shall [...] IAPMO Z402. Group wash fixtures shall comply with the requirements of Section 401.2. Every 20 inches (508 mm) of rim space of a group wash fixture shall be considered as one lavatory for determining the number of lavatories required in accordance with Table 422.1. Lavatory assemblies with automatic soap dispensers, faucets, or hand dryers shall comply with IAPMO IGC 127.

(2018)

**407.3 Limitation of Hot Water
Temperature for Public Lavatories:**

- Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C).

(2021)

**407.3 Limitation of Hot Water
Temperature for Public Lavatories:**

- Hot water [...] temperature of 120° (49°C). The maximum temperature shall be regulated by one of the following means:
 1. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70, or
 2. A water heater conforming to ASSE 1084.

412.1.2 Nonwater Urinals with Drain Cleansing Action (Newly Added)

- Nonwater urinals with drain cleansing action shall comply with ASME A112.19.19 and shall be cleaned, maintained and installed in accordance with the manufacturer's installation instructions.

417.6 Low-Pressure Water Dispenser (Newly Added)

- Beverage faucets shall comply with ASME A112.18.1/CSA B125.1. Low-pressure water dispensers that dispense electrically heated water and have a reservoir vented to the atmosphere shall comply with ASSE 1023. Electric devices that heat water shall comply with UL 499.

401.0 General

401.1 Applicability

- This chapter shall govern the materials and installation of plumbing fixtures, including faucets and fixture fittings, and the minimum number of plumbing fixtures required based on occupancy.

401.2 Quality of Fixtures

- Plumbing fixtures shall be constructed of dense, durable, non-absorbent materials and shall have smooth, impervious surfaces, free from unnecessary concealed fouling surfaces.

402.0 Installation

402.1 Cleaning

- Plumbing fixtures shall be installed in a manner to afford easy access for repairs and cleaning. Pipes from fixtures shall be run to the nearest wall.

402.2 Joints

- Where a fixture comes in contact with the wall or floor, the joint between the fixture and the wall or floor shall be made watertight.

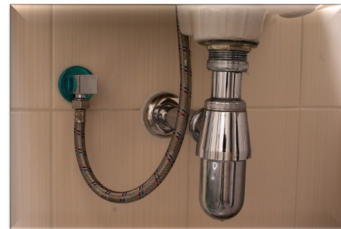


Figure 9: Joints between wall and plumbing fixture shall be watertight

402.5 Setting.

- Fixtures shall be set level and in proper alignment with reference to adjacent walls. No water closet or bidet shall be set closer than fifteen (15) inches (381 mm) from its center to any side wall or obstruction nor closer than thirty (30) inches (762 mm) center to center to any similar fixture. The clear space in front of any water closet or bidet shall be not less than twenty-four (24) inches (610 mm). No urinal shall be set closer than twelve (12) inches (305 mm) from its center to any side wall or partition nor closer than twenty-four (24) inches (610 mm) center to center.
- **EXCEPTIONS:**
 1. The clear space in front of a water closet, lavatory or bidet in dwelling units and sleeping units shall be not less than 21 inches (533 mm).
 2. The installation of paper dispensers or accessibility grab bars shall not be considered obstructions.

402.6 Flanged Fixture Connections

- Fixture connections between drainage pipes and water closets, floor outlet service sinks and urinals shall be made using an approved copper alloy, hard lead, ABS, PVC, or iron flanges caulked, soldered, solvent cemented; rubber compression gaskets; or screwed to the drainage pipe.
- The connection shall be bolted with an approved gasket, washer, or setting compound between the fixture and the connection. The bottom of the flange shall be set on an approved firm base.
- Wall-mounted water closet fixtures shall be securely bolted to an approved carrier fitting. The connecting pipe between the carrier fitting and the fixture shall be an approved material and designed to accommodate an adequately sized gasket.
- Gasket material shall be neoprene, felt, or similar approved types.

402.6.2 Securing Closet Flanges

- Closet screws, bolts, washers, and similar fasteners shall be of copper alloy, copper, or other listed equally corrosion-resistant materials. Screws and bolts shall be of a size and number to properly support the fixture installed.

402.9 Design and Installation of Plumbing Fixtures

- Plumbing fixtures shall be installed in accordance with the manufacturer's installation instructions. The means of backflow prevention shall not be compromised by the designated fixture fitting mounting surface.

402.11 Future Fixtures

- Where provisions are made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of the drain and water supply piping. Construction for future installations shall be terminated with a plugged fitting or fittings.
- Where the plugged fitting is at the point where the trap of a fixture is installed, the plumbing system for such fixture shall be complete and be in accordance with the plumbing requirements of this code.

403.0 Accessible Plumbing Facilities

403.1 General

- Where accessible facilities are required in applicable building regulations, the facilities shall be installed in accordance with those regulations.

403.2 Fixtures and Fixture Fittings for Persons with Disabilities

- Plumbing fixtures and fixture fittings for persons with disabilities shall be in accordance with ICC A117.1 and the applicable standards referenced in Chapter 4.

403.3 Exposed Pipes and Surfaces

- Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise be configured to protect against contact. Protectors, insulators, or both shall comply with ASME A112.18.9 or ASTM C1822.

404.0 Waste Fittings and Overflows

404.1 Waste Fittings

- Waste fittings shall comply with ASME A112.18.2/CSA B125.2, ASTM F409 or Table 701.2 for aboveground drainage piping and fittings.

405.0 Prohibited Fixtures

405.1 Prohibited Water Closets

- Water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge shall be prohibited. A water closet that might permit siphonage of the contents of the bowl back into the tank shall be prohibited

405.4 Application.

- No individual, public or private corporation, firm, political subdivision, government agency, or other legal entity, may, for purposes of use in the state of Washington, distribute, sell, offer for sale, import, install, or approve for installation any plumbing fixtures or fittings unless the fixtures or fittings meet the standards as provided for in this chapter.

406.0 Special Fixtures and Specialties

406.1 Water and Waste Connections

- Baptisteries, ornamental and lily ponds, aquaria, ornamental fountain basins, and similar fixtures and specialties requiring water, waste connections, or both shall be submitted for approval to the Authority Having Jurisdiction prior to installation.

406.2 Special Use Sinks

- Restaurant kitchen and other special use sinks shall be permitted to be made of approved type bonderized and galvanized sheet steel of not less than No. 16 U.S. gauge (0.0635 inches) (1.6 mm).
- Sheet-metal plumbing fixtures shall be adequately designed, constructed, and braced in an approved manner to accomplish their intended purpose.

406.3 Special Use Fixtures

- Special use fixtures shall be made of one of the following:
 1. Soapstone
 2. Chemical stoneware
 3. Copper-based alloy
 4. Nickel-based alloy
 5. Corrosion-resistant steel
 6. Other materials suited for the intended use of the fixture

407.0 Lavatories

407.1 Application

- Lavatories shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, ASME A112.19.12, CSA B45.5/IAPMO Z124, CSA B45.8/IAPMO Z403, CSA B45.11/IAPMO Z401 or CSA B45.12/IAPMO Z402.
- Group wash fixtures shall comply with the requirements of Section 401.2. Every 20 inches (508 mm) of rim space of a group wash fixture shall be considered as one lavatory for determining the number of lavatories required in accordance with the International Building Code Table 2902.1.
- Lavatory assemblies with automatic soap dispensers, faucets, or hand dryers shall comply with IAPMO IGC 127.

TYPE OF OCCUPANCY ²	WATER CLOSETS (FIXTURES PER PERSON) ³		URINALS (FIXTURES PER PERSON) ⁴	LAVATORIES (FIXTURES PER PERSON) ⁵		BATHTUBS OR SHOWERS (FIXTURES PER PERSON)	DRINKING FOUNTAINS/FACILITIES (FIXTURES PER PERSON)	OTHER
A-1 Assembly occupancy (fixed or permanent seating)- theaters, concert halls, and auditoriums	Male 1: 1-100 2: 101-200 3: 201-400	Female 1: 1-25 2: 26-50 3: 51-100 4: 101-200 5: 201-300 6: 301-400	Male 1: 1-200 2: 201-300 3: 301-400 4: 401-600	Male 1: 1-200 2: 201-400 3: 401-600 4: 601-750	Female 1: 1-100 2: 101-200 3: 201-300 4: 301-500 5: 501-750	—	1: 1-250 2: 251-500 3: 501-750	1 service sink or laundry tray
	Over 400, add 1 fixture for each additional 500 males and 1 fixture for each additional 125 females.		Over 600, add 1 fixture for each additional 300 males.	Over 750, add 1 fixture for each additional 250 males and 1 fixture for each additional 200 females.		—	Over 750, add 1 fixture for each additional 500 persons.	
	Male 1: 1-50 2: 51-150 3: 151-300 4: 301-400	Female 1: 1-25 2: 26-50 3: 51-100 4: 101-200 5: 201-300 6: 301-400	Male 1: 1-200 2: 201-300 3: 301-400 4: 401-600	Male 1: 1-150 2: 151-200 3: 201-400	Female 1: 1-150 2: 151-200 3: 201-400	—	1: 1-250 2: 251-500 3: 501-750	
A-2 Assembly occupancy- restaurants, pubs, lounges, nightclubs and banquet halls	Male 1: 1-50 2: 51-150 3: 151-300 4: 301-400	Female 1: 1-25 2: 26-50 3: 51-100 4: 101-200 5: 201-300 6: 301-400	Male 1: 1-200 2: 201-300 3: 301-400 4: 401-600	Male 1: 1-150 2: 151-200 3: 201-400	Female 1: 1-150 2: 151-200 3: 201-400	—	1: 1-250 2: 251-500 3: 501-750	1 service sink or laundry tray
	Over 400, add 1 fixture for each additional 250 males and 1 fixture for each 125 females.		Over 600, add 1 fixture for each additional 300 males.	Over 400, add 1 fixture for each additional 250 males and 1 fixture for each additional 200 females.		—	Over 750, add 1 fixture for each additional 500 persons.	
	Male 1: 1-50 2: 51-150 3: 151-300 4: 301-400	Female 1: 1-25 2: 26-50 3: 51-100 4: 101-200 5: 201-300 6: 301-400	Male 1: 1-200 2: 201-300 3: 301-400 4: 401-600	Male 1: 1-150 2: 151-200 3: 201-400	Female 1: 1-150 2: 151-200 3: 201-400	—	1: 1-250 2: 251-500 3: 501-750	

Table 2: Minimum Plumbing Facilities
(Source: IAPMO/ANSI, UPC, 1 2021, table 422.1)

407.2 Water Consumption.

- The maximum water flow rate of faucets shall comply with Section 407.2.1 through 407.2.2.

407.2.1 Maximum Flow Rate.

- The maximum flow rate for public lavatory faucets shall not exceed 0.5 gpm at 60 psi (1.9 L/m at 414 kPa).

407.2.1.1 Residential Lavatory Faucets.

- The maximum flow rate of residential lavatory faucets shall not exceed 1.2 gallons (4.54 L) per minute at 60 psi. The minimum flow rate of residential lavatory faucets shall not be less than 0.8 gallons (3.03 L) per minute at 20 psi.

407.2.1.2 Lavatory Faucets in Common and Public Use Areas.

- The maximum flow rate of lavatory faucets, installed in common and public use areas (outside of dwellings or sleeping units) in residential buildings, shall not exceed 0.5 gallons (1.89 L) per minute at 60 psi.

407.2.2 Metering Faucets.

- Metered faucets shall deliver a maximum of 0.25 gallons (1.0 L) per metering cycle in accordance with ASME A112.18.1/CSA B125.1.

407.3 Limitation of Hot Water Temperature for Public Lavatories

- Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C).
- The maximum temperature shall be regulated by one of the following means:
 1. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70, or
 2. A water heater conforming to ASSE 1084.

407.4 Metering Valves.

- Lavatory faucets located in restrooms intended for use by the general public shall be equipped with a metering valve designed to close by spring or water pressure when left unattended (self-closing).
- EXCEPTIONS:
 1. Where designed and installed for use by persons with a disability.
 2. Where installed in day care centers, for use primarily by children under 6 years of age.

407.5 Waste Outlet

- Lavatories shall have a waste outlet and fixture tailpiece not less than 1.25 inches (32 mm) in diameter. Continuous wastes and fixture tailpieces shall be constructed from the materials specified in Section 701.4. Waste outlets shall be provided with an approved stopper or strainer.

408.0 Showers

408.1 Application

- Manufactured shower receptors and shower bases shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSAB45.4, CSA B45.12/IAPMO Z402, or CSA B45.5/IAPMO Z124. Prefabricated shower enclosures shall comply with IAPMO IGC 154.

408.2 Water Consumption

- Showerheads shall meet the maximum flow rate of 1.8 gallons (6.81 L) per minute measured at 80 psi. Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.
- EXCEPTION: Emergency use showers shall be exempt from the maximum water usage rates.

408.2.1 Multiple Showerheads Serving One Shower.

- When a shower is served by more than one showerhead, including handheld showerheads, the combined flow rate of all showerheads and/or other shower outlets controlled by a single valve shall not exceed 1.8 gallons (6.81 L) per minute at 80 psi, or the shower shall be designed to allow only one shower outlet to be in operation at a time.

408.3 Individual Shower and Tub-Shower Combination Control Valves

- Showers and tub-shower combinations shall be provided with individual control valves of the pressure balance, thermostatic, or combination pressure balance/thermostatic mixing valve type that provide scald and thermal shock protection for the rated flow rate of the installed showerhead.
- These valves shall be installed at the point of use and comply with ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1.

408.3.1 Gang Showers

- Where gang showers are supplied with a single temperature-controlled water supply pipe, it shall be controlled by a mixing valve that complies with ASSE 1069.

408.4 Waste Outlet.

- Showers shall have a waste outlet and fixture tailpiece not less than two (2) inches (50 mm) in diameter. Fixture tailpieces shall be constructed from the materials specified in Section 701.2 for drainage piping. Strainers serving shower drains shall have a waterway at least equivalent to the area of the tailpiece.
- EXCEPTION: In a residential dwelling unit where a 2 inch waste is not readily available and approval of the AHJ has been granted, the waste outlet, fixture tailpiece, trap and trap arm may be 1-1/2 inch when an existing tub is being replaced by a shower sized per Section 408.2. This exception only applies where one shower head rated at 1.8 gpm is installed.

408.6 Shower Compartments.

- Shower compartments, regardless of shape, shall have a minimum finished interior of nine hundred (900) square inches (0.58 m²) and shall also be capable of encompassing a thirty (30) inch (762 mm) circle. The minimum required area and dimensions shall be measured at a height equal to the top of the threshold and at a point tangent to its centerline. The area and dimensions shall be maintained to a point of not less than seventy (70) inches (1,778 mm) above the shower drain outlet with no protrusions other than the fixture valve or valves, shower head, soap dishes, shelves, and safety grab bars or rails. Fold-down seats in accessible shower stalls shall be permitted to protrude into the thirty (30) inch (762 mm) circle.
- EXCEPTIONS:
 1. Showers that are designed to comply with ICC/ANSI A117.1.
 2. The minimum required area and dimension shall not apply for a shower receptor having overall dimensions of not less than thirty (30) inches (762 mm) in width and sixty (60) inches (1,524 mm) in length.

408.9 Location of Valves and Heads

- Control valves and showerheads shall be located on the sidewall of shower compartments or otherwise arranged so that the showerhead does not discharge directly at the entrance to the compartment so that the bather can adjust the valves before stepping into the shower spray.

409.0 Bathtubs and Whirlpool Bathtubs

409.1 Application

- Bathtubs shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, CSA B45.5/IAPMO Z124, or CSA B45.12/IAPMO Z402.
- Whirlpool bathtubs shall comply with ASME A112.19.7/CSA B45.10. Pressure sealed doors within a bathtub or whirlpool bathtub enclosure shall comply with ASME A112.19.15.

409.3 Overflow

- Where overflows are provided, they shall be installed in accordance with Section 404.2.

409.4 Limitation of Hot Water Temperature in Bathtubs and Whirlpool Bathtubs

- The maximum hot water temperature discharging from the bathtub and whirlpool bathtub filler shall be limited to 120°F (49°C).
- The maximum temperature shall be regulated by one of the following means:
 1. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.
 2. A water heater conforming to ASSE 1084.

410.0 Bidets

410.1 Application

- Bidets shall comply with ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.



Figure 10: Bidets shall comply with applicable ASME standards

410.2 Backflow Protection

- The water supply to the bidet shall be protected by an air gap or in accordance with Section 603.3.2, Section 603.3.5, or Section 603.3.6.

410.3 Limitation of Water Temperature in Bidets

- The maximum hot water temperature discharging from a bidet shall be limited to 110°F (43°C). The maximum temperature shall be regulated by one of the following means:
 1. A limiting device conforming to either ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.
 2. A water heater conforming to ASSE 1084.

411.2 Water Consumption.

- The effective flush volume of all water closets shall not exceed 1.28 gallons (4.8 L) per flush when tested in accordance with ASME A112.19.2/CSA B45.1.
- EXCEPTIONS:
 1. Water closets located in day care centers, intended for use by young children may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.
 2. Water closets with bed pan washers may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.
 3. Blow out bowls, as defined in ANSI/ASME A112.19.2M, Section 5.1.2.3 may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.

411.2.2 Performance.

- Water closets installed shall meet or exceed the minimum performance criteria developed for certification of high-efficiency toilets under the WaterSense program sponsored by the U.S. Environmental Protection Agency (EPA).

411.2.3 Flushometer Valve Activated Water Closets.

- Flushometer valve activated water closets shall have a maximum flush volume of 1.28 gallons (4.8 Lpf) of water per flush in accordance with ASME A112.19.2/CSA B45.1.

412.0 Urinals

- 412.1 Application. Urinals shall comply with ASME A112.19.2/CSA B45.1, ASME A112.19.19, or CSA B45.5/IAPMO Z124. Urinals shall have an average water consumption not to exceed 1 gallon (3.8 Lpf) of water per flush.



Figure 11: Urinals shall comply with applicable ASME standards

412.1 Application.

Urinals shall comply with ASME A112.19.2/CSA B45.1, ASME A112.19.19, or CSA B45.5/IAPMO Z124. Wall-mounted urinals shall have an average water consumption not to exceed 0.125 gallons (0.47 L) per flush. Other urinals shall have an average water consumption not to exceed 0.5 gallons (1.89 L) per flush.

412.2 Backflow Protection

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A water supply to a urinal shall be protected by an approved-type vacuum breaker or other approved backflow prevention device in accordance with

412.1 Application.

- Urinals shall comply with ASME A112.19.2/CSA B45.1, ASME A112.19.19, or CSA B45.5/IAPMO Z124. Wall-mounted urinals shall have an average water consumption not to exceed 0.125 gallons (0.47 L) per flush. Other urinals shall have an average water consumption not to exceed 0.5 gallons (1.89 L) per flush.

412.2 Backflow Protection

- A water supply to a urinal shall be protected by an approved-type vacuum breaker or other approved backflow prevention device in accordance with Section 603.5.

413.0 Flushing Devices

413.1 Where Required

- Each water closet, urinal, clinical sink, or other plumbing fixture that depends on trap siphonage to discharge its waste contents shall be provided with a flushometer valve, flushometer tank, or flush tank designed and installed so as to supply water in sufficient quantity and rate of flow to flush the contents of the fixture to which it is connected, to cleanse the fixture, and to refill the fixture trap, without excessive water use.
- Flushing devices shall comply with the antisiphon requirements in accordance with Section 603.5.

413.4 Water Supply for Flush Tanks

- An adequate quantity of water shall be provided to flush and clean the fixture served.
- The water supply for flushing tanks and flushometer tanks equipped for manual flushing shall be controlled by a float valve or other automatic device designed to refill the tank after each discharge and to shut completely off the water flow to the tank where the tank is filled to operational capacity.
- Provision shall be made to automatically supply water to the fixture to refill the trap seal after each flushing.

414.0 Dishwashing Machines

414.1 Application

- Domestic dishwashing machines shall comply with UL 749. Commercial dishwashing machines shall comply with NSF 3 and UL 921.

414.2 Backflow Protection

- The water supply connection to a commercial dishwashing machine shall be protected by an air gap or a backflow prevention device in accordance with Section 603.3.2, Section 603.3.5, Section 603.3.6, or that complies with ASSE 1004.

414.3 Drainage Connection.

- Domestic dishwashing machines shall discharge indirectly through an air gap fitting in accordance with Section 807.3 into a waste receptor, a wye branch fitting on the tailpiece of a kitchen sink, or dishwasher connection of a food waste disposer. Commercial dishwashing machines shall discharge indirectly through an air gap.

415.0 Drinking Fountains

415.1 Application

- Drinking fountains shall be self-closing and comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, or ASME A112.19.3/CSA B45.4. Drinking fountains shall also comply with NSF 61.
- Permanently installed electric water coolers shall also comply with UL 399.

415.2 Drinking Fountain Alternatives.

- This section is not adopted. See Building Code chapter 29.

415.3 Drainage Connection

- Drinking fountains shall be permitted to discharge directly into the drainage system or indirectly through an air break in accordance with Section 809.1.

416.0 Emergency Eyewash and Shower Equipment

416.1 Application

- Emergency eyewash and shower equipment shall comply with ISEA Z358.1.

416.3 Installation

- Emergency eyewash and shower equipment shall be installed in accordance with the manufacturer's installation instructions.

416.4 Location

- Emergency eyewash and shower equipment shall be located on the same level as the hazard and accessible for immediate use. The path of travel shall be free of obstructions and shall be clearly identified with signage.

417.0 Faucets and Fixture Fittings

417.1 Application

- Faucets and fixture fittings shall comply with ASME A112.18.1/CSA B125.1. Fixture fittings covered under the scope of NSF 61 shall comply with the requirements of NSF 61.

418.0 Floor Drains

418.1 Application

- Floor drains shall comply with ASME A112.3.1, ASME A112.6.3, or CSA B79.

418.3 Location of Floor Drains

- Floor drains shall be installed in the following areas:
 1. Toilet rooms containing two (2) or more water closets or a combination of one (1) water closet and one (1) urinal, except in a dwelling unit. The floor shall slope toward the floor drains.
 2. Laundry rooms in commercial buildings and common laundry facilities in multifamily dwelling buildings.

419.0 Food Waste Disposers

419.1 Application

- Food waste disposal units shall comply with UL 430. Residential food waste disposers shall also comply with ASSE 1008.

419.2 Drainage Connection

- Approved wye or other directional-type branch fittings shall be installed in continuous wastes connecting or receiving the discharge from a food waste disposer.

419.3 Water Supply

- A cold-water supply shall be provided for food waste disposers. Such connection to the water supply shall be protected by an air gap or backflow prevention device in accordance with Section 603.2.

420.0 Sinks

420.1 Application

- Sinks shall comply with ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, CSA B45.5/IAPMO Z124, CSA B45.8/IAPMO Z403, or CSA B45.12/IAPMO Z402. Moveable sink systems shall comply with ASME A112.19.12. Sink assemblies with automatic soap dispensers, faucets, or hand dryers shall comply with IAPMO IGC 127.

420.2 Water Consumption

- Sink faucets shall have a maximum flow rate of not more than 2.2 gpm at 60 psi (8.3 L/m at 414 kPa) in accordance with ASME A112.18.1/CSA B125.1.
 - Exceptions:
 - (1) Clinical sinks
 - (2) Laundry trays
 - (3) Service sinks

420.2.1 Kitchen Faucets.

- Kitchen faucets shall have a maximum flow rate of not more than 1.8 gallons (6.81 L) per minute at 60 psi. Kitchen faucets may temporarily increase the flow above the maximum rate, but not to exceed 2.2 gallons (8.3 L) per minute at 60 psi, and must default to a maximum flow rate of 1.8 gallons (6.81 L) per minute at 60 psi.
- EXCEPTION: Where faucets meeting the maximum flow rate of 1.8 gpm (6.81 L) are unavailable, aerators or other means may be used to achieve reduction.

420.3 Pre-Rinse Spray Valve

- Commercial food service prerinse spray valves shall have a maximum flow rate of 1.6 gallons per minute (gpm) at 60 pounds-force per square inch (psi) (6.0 L/m at 414 kPa) in accordance with ASME A112.18.1/CSA B125.1 and shall be equipped with an integral automatic shutoff.

420.4 Waste Outlet

- Kitchen and laundry sinks shall have a waste outlet and fixture tailpiece not less than 1½ inches (40 mm) in diameter.
- Service sinks shall have a waste outlet and fixture tailpiece not less than 2 inches (50 mm) in diameter.
- Fixture tailpieces shall be constructed from the materials specified in Section 701.2 for drainage piping. Waste outlets shall be provided with an approved strainer.

421.0 Floor Sinks

421.1 Application

- Floor sinks shall comply with ASME A112.6.7.

421.2 Strainers

- The waste outlet of a floor sink shall be provided with an approved strainer or grate that is removable and accessible.

422.0 Minimum Number of Required Fixtures

422.0 Minimum Number of Required Fixtures.

- For minimum number of plumbing fixtures required, see Building Code Chapter 29 and Table 2902.1.

Sections 422.1 through 422.5 and Table 422.1 are not adopted.

423.0 Landscape Irrigation.

423.1 Spray Sprinkler Body.

- Spray sprinkler bodies must include an integral pressure regulator and must meet the water efficiency and performance criteria and other requirements of environmental protection agency water sense program product specification for spray sprinkler bodies.
- EXCEPTION: Spray sprinkler bodies specifically excluded from the scope of the environmental protection agency water sense program product specification for spray sprinkler bodies.

CHAPTER 5 WATER HEATERS

Chapter 5 regulates the design, approval, installation, and safety devices of fuel burning and other types of water heaters with the combustion air requirements for ventilation and dilution of flue gases for appliances installed in buildings. this chapter does not apply to direct-vent appliances.

In addition, this chapter regulates the design, construction, installation, maintenance of chimneys, vents and their connections to fuel burning appliances.

Methods to supply combustion air may be supplied from an indoor air supply, outdoor air supply, a combination of indoor and outdoor air supply, mechanical air supply, or an engineered system. combustion air provisions are based on the number of openings and the total opening size required based on the total energy input rating of the appliance.

(2018)

506.2.1 Standard Method:

- The required volume shall not be less than 50 cubic feet per 1000 British thermal units per hour (Btu/h) (4 point 83 m³ /kW).

(2021)

506.2.1 Standard Method:

- The **minimum** required volume shall ~~not be less than~~ 50 cubic feet per 1000 British thermal units per hour (Btu/h) (4.83 m³/kW).

508.2.1.1 Guards and Rails (Newly Added)

- Guards or rails shall be required where the following exist:
 1. The clearance between the appliance and a roof edge or open end of an equipment platform is less than 6 feet (1829 mm).
 2. The open end of the equipment platform is located more than 30 inches (762 mm) above the roof, floor, or grade below.
- Where guards or rails are installed, they shall be constructed so as to prevent the passage of a 21 inch (533 mm) diameter ball, resist the imposed loading conditions, and shall extend not less than 30 inches (762 mm) beyond each side of the equipment or appliance.
- Exception: Guards shall not be required where a permanent fall arrest anchorage connector system in accordance with ASSE Z359.1 is installed.

(2018)

509.2.4 Ventilating Hoods:

- Ventilating hoods and exhaust systems shall be permitted to be used to vent appliances installed in commercial applications and to vent industrial appliances, particularly where the process itself requires fume disposal.

(2021)

509.2.4 Ventilating Hoods:

- The use of ventilating hoods and exhaust systems shall be permitted to be used to vent appliances installed in commercial applications and to vent shall be limited to industrial appliances and appliances installed in commercial applications particularly where the process itself requires fume disposal.

501.0 General

501.1 Applicability

- The regulations of this chapter shall govern the construction, location, and installation of fuel burning and other types of water heaters heating potable water. The minimum capacity for water heaters shall be in accordance with the first hour rating listed in Table 501.1(2). See the Mechanical Code for combustion air and installation of all vents and their connectors. No water heater shall be hereinafter installed that does not comply with the manufacturer's installation instructions and the type and model of each size thereof approved by the authority having jurisdiction. A list of accepted water heater appliance standards is referenced in Table 501.1 (1). Listed appliances shall be installed in accordance with the manufacturer's installation instructions. Unlisted water heaters shall be permitted in accordance with Section 504.3.2.

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating, ² Gallons	38	49	49	49	62	62	74	62	74	74	74

Table 3: First Hour Rating

(Source: IAPMO/ANSI, UPC, 1 2021, table 501.1(2) 1, 2)

Notes:

1. The first hour rating is found on the "Energy Guide" label.
2. Non-storage and solar water heaters shall be sized to meet the appropriate first hour rating as shown in the table and shall be capable of delivering hot water at the maximum system demand flow, as calculated in Section 610.0 or Appendix A, as applicable.
3. For replacement water heaters, see Section 102.4.

- No water heater shall be hereinafter installed that does not comply with the manufacturer's installation instructions and the type and model of each size thereof approved by the Authority Having Jurisdiction.
- A list of accepted water heater appliance standards is referenced in Table 501.1(1).
- Listed appliances shall be installed in accordance with the manufacturer's installation instructions. Unlisted water heaters shall be permitted in accordance with Section 504.3.2.

TYPE	STANDARD
Electric, Household Storage	UL 174
Oil-Fired Storage Tank	UL 732
Gas-Fired, 75 000 Btu/h or less, Storage	CSA Z21.10.1
Gas-Fired, Above 75 000 Btu/h, Storage and Instantaneous	CSA Z21.10.3
Electric, Commercial Storage	UL 1453
Solid Fuel-Fired	UL 2523
Electric Instantaneous	UL 499

Table 4: Water heaters

(Source: IAPMO/ANSI, UPC, 1 2021, table 501.1(1))

501.1.2 Consumer Electric Storage Water Heater Requirements.

- Consumer electric storage water heaters must have a modular demand response communications port compliant with the March 2018 version of the ANSI/CTA-2045-A communication interface standard, or equivalent and the March 2018 version of the ANSI/CTA-2045-A application layer requirements. The interface standard and application layer requirements required in this subsection are the versions established on March 16, 2018.
- EXCEPTIONS:
 1. Water heaters manufactured prior to January 1, 2021.
 2. Electric storage water heaters other than heat pump type water heaters manufactured prior to January 1, 2022.

501.1.3 Mini-tank Electric Water Heaters.

- The standby energy consumption of hot water dispensers and minitank electric water heaters manufactured on or after January 1, 2010, shall be not greater than 35 watts. Minitank electric water heaters shall be tested in accordance with the method specified in the California Code of 39 Regulations, Title 20, section 1604 in effect as of July 26, 2009.

502.0 Permits

502.1 General

- It shall be unlawful for a person to install, remove, or replace or cause to be installed, removed, or replaced a water heater without first obtaining a permit from the Authority Having Jurisdiction to do so.

503.0 Inspection

503.1 Inspection of Chimneys or Vents

- This inspection shall be made after chimneys, vents, or parts thereof, authorized by the permit, have been installed and before such vent or part thereof has been covered or concealed.

503.2 Final Water Heater Inspection

- This inspection shall be made after work authorized by the permit has been installed.
- The Authority Having Jurisdiction will make such inspection as deemed necessary to be assured that the work has been installed in accordance with the intent of this code.
- No appliance or part thereof shall be covered or concealed until the same has been inspected and approved by the Authority Having Jurisdiction.



Figure 12: Final water heater inspection shall be made after work authorized by the permit has been installed

504.0 Water Heater Requirements

504.1 Location.

- Water heater installation in bedrooms and bathrooms shall comply with one of the following:
 1. Fuel-burning water heaters may be installed in a closet located in the bedroom or bathroom provided the closet is equipped with a listed, gasketed door assembly and a listed self-closing device. The self-closing door assembly shall meet the requirements of Section 504.1.1. The door assembly shall be installed with a threshold and bottom door seal and shall meet the requirements of Section 504.1.2. All combustion air for such installations shall be obtained from the outdoors in accordance with the International Mechanical Code. The closet shall be for the exclusive use of the water heater.
 2. Water heater shall be of the direct vent type.

504.2 Vent

- Water heaters of other than the direct-vent type shall be located as close as practical to the chimney or gas vent.

504.3 Clearance

- The clearance requirements for water heaters shall comply with Section 504.3.1 or Section 504.3.2.

504.3.1 Listed Water Heaters

- The clearances shall not be such as to interfere with combustion air, draft hood clearance and relief, and accessibility for servicing.
- Listed water heaters shall be installed in accordance with their listings and the manufacturer's installation instructions.

504.3.2 Unlisted Water Heaters

- Unlisted water heaters shall be installed with a clearance of 12 inches (305 mm) on all sides and rear.
- Combustible floors under unlisted water heaters shall be protected in an approved manner.

505.0 Oil-Burning and Other Water Heaters

505.1 Water Heaters

- Water heaters deriving heat from fuels or types of energy other than gas shall comply with the standards referenced in Table 501.1(1), Section 505.3, or Section 505.4. Vents or chimneys for such appliances shall be of approved types.
- An adequate supply of air for combustion and for adequate ventilation of heater rooms or compartments shall be provided.
- Each such appliance shall be installed in a location approved by the Authority Having Jurisdiction and local and state fire-prevention agencies.

505.2 Safety Devices.

- All storage-type water heaters deriving heat from fuels or types of energy other than gas, shall be provided with, in addition to the primary temperature controls, an over-temperature safety protection device constructed, listed, and installed in accordance with nationally recognized applicable standards for such devices and a combination temperature and pressure relief valve.

505.3 Oil-Fired Water Heaters

- Oil-fired water heaters shall be installed in accordance with NFPA 31.

505.4 Indirect-Fired Water Heaters

- Indirect-fired water heaters shall be in accordance with the applicable sections of the ASME Boiler and Pressure Vessel Code or shall comply with one of the other applicable standards shown in Table 501.1(1).
- Each water heater shall bear a label in accordance with ASME requirements, or an approved testing agency, certifying and attesting that such an appliance has been tested, inspected and meets the requirements of the applicable standards or code.

506.0 Combustion Air.

- For issues relating to combustion air, see the Mechanical Code.

Sections 506.1 through 506.9 are not adopted.

507.0 Appliance and Equipment Installation Requirements

507.1 Dielectric Insulator

- The Authority Having Jurisdiction shall have the authority to require the use of an approved dielectric insulator on the water piping connections of water heaters and related water heating appliances.

507.2 Seismic Provisions

- Water heaters shall be anchored or strapped to resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of its vertical dimensions.
- At the lower point, a distance of not less than 4 inches (102 mm) shall be maintained from the controls with the strapping.

507.3 Appliance Support

- Appliances and equipment shall be furnished either with load distributing bases or with a sufficient number of supports to prevent damage to either the building structure or the appliance and the equipment.

507.4 Ground Support

- A water heater supported from the earth shall rest on level concrete or other approved base extending not less than 3 inches (76 mm) above the adjoining ground level.

507.5 Drainage Pan

- Where a water heater is located in an attic, in or on an attic ceiling assembly, floor-ceiling assembly, or floor-subfloor assembly where damage results from a leaking water heater, a watertight pan of corrosion-resistant materials shall be installed beneath the water heater with not less than 3/4 of an inch (20 mm) diameter drain to an approved location. Such pan shall be not less than 1 1/2 inches (38 mm) in depth.

Sections 507.6 through 507.9 are not adopted.

507.11 Process Air

- In addition to air needed for combustion in commercial or industrial processes, process air shall be provided as required for cooling of appliances, equipment, or material; for controlling dew point, heating, drying, oxidation, dilution, safety exhaust, odor control, and air for compressors; and for comfort and proper working conditions for personnel.

507.13 Installation in Garages

- Appliances in garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that burners, burner-ignition devices and ignition sources are located not less than eighteen (18) inches above the floor unless listed as flammable vapor ignition resistant.



Figure 14: Burner devices in residential garages shall be installed not less than 18 inches above the floor

507.13.1 Physical Damage

- Appliances installed in garages, warehouses, or other areas subject to mechanical damage shall be guarded against such damage by being installed behind protective barriers or by being elevated or located out of the normal path of vehicles.

507.13.2 Access from the Outside

- Where appliances are installed in a separate, enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, providing the required combustion air is taken from the exterior of the garage.

507.15 Installation in Aircraft Hangars

- Heaters in aircraft hangars shall be installed in accordance with NFPA 409.

507.17 Extra Device or Attachment

- No device or attachment shall be installed on any appliance that could in any way impair the combustion of gas.

Sections 507.18 through 507.22 are not adopted.

508.0 Appliances on Roofs

508.1 General

- Appliances on roofs shall be designed or enclosed so as to withstand climatic conditions in the area in which they are installed.
- Where enclosures are provided, each enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least a 30 inch (762 mm) clearance between the entire service access panel(s) of the appliance, and the wall of the enclosure.

508.1.1 Load Capacity

- Roofs on which appliances are to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load.

508.1.2 Fasteners

- All access locks, screws, and bolts shall be of corrosion-resistant material.

508.2 Installation of Appliances on Roofs

- Appliances shall be installed in accordance with the manufacturer's installation instructions.

508.2.1 Edge of Roof Clearance

- Appliances shall be installed on a well-drained surface of the roof. At least 6 feet (1829 mm) of clearance shall be available between any part of the appliance and the edge of a roof or similar hazard, or rigidly fixed rails, guards, parapets, or other building structures at least 42 inches (1067 mm) in height shall be provided on the exposed side.

508.3 Appliances on Roofs

- Appliances located on roofs or other elevated locations shall be accessible.

508.3.1 Access

- Buildings of more than 15 feet (4572 mm) in height shall have an inside means of access to the roof, unless other means acceptable to the Authority Having Jurisdiction are used.

CHAPTER 6 WATER SUPPLY AND DISTRIBUTION

Chapter 6 regulates the design, material and installation of water supply and distribution systems, including residential fire sprinklers. The water supply and distribution system is designed to achieve the correct water pressure and flow rates and avoid cross connections.

For fixtures to perform properly, an acceptable supply of potable water is essential to their operation and use. cross connections and backflow are ranked as the highest priority because of the long history of recognized health risks posed by cross connections, outbreaks, or cases of waterborne disease.

Piping materials and components are evaluated for their possible effect on the potable water with which they are in contact.

CHAPTER 6 WATER SUPPLY AND DISTRIBUTION (CONT'D)

603.3.10 Dual Check Backflow Preventer (Newly Added)

- A dual check backflow preventer consists of two independently acting check valves, force loaded to a normally closed position.

603.3.11 Laboratory Faucet Backflow Preventers (Newly Added)

- Laboratory faucet backflow preventers shall comply with ASSE 1035.

603.3.12 Backflow Preventer with Intermediate Atmospheric Vent (Newly Added)

- A backflow preventer with intermediate atmospheric vent consists of two independently acting check valves, force loaded to a normally closed position, and an intermediate chamber with a means for automatically venting to atmosphere, force loaded to a normally open position.

606.8 Check Valve Required (Newly Added)

- All systems that circulate water by means of a pump or other mechanical device or method shall have a check valve(s) or equal device(s) installed so as to ensure the direction of flow.

606.9 Leak Detection Devices (Newly Added)

- Where leak detection devices for water supply and distribution are installed, they shall comply with IAPMO IGC 115 or IAPMO IGC 349.

609.8 Pumps (Newly Added)

- Pumps shall be installed in accordance with the manufacturer's installation instructions.

609.8.1 Access (Newly Added)

- Pumps shall be accessible for repairs. 609.8.2 Potable Water Pumps. Pumps intended to supply drinking water shall be in accordance with NSF 61.



609.8.2 Potable Water Pumps (Newly Added)

- Pumps intended to supply drinking water shall be in accordance with NSF 61.

Figure 16: Potable water pumps intended to supply drinking water shall be in accordance with NSF 61

601.0 General

601.1 Applicability

- This chapter shall govern the materials, design and installation of water supply systems, including backflow prevention devices, assemblies and methods used for backflow prevention.

601.2 Water Supply and Flushing

- 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 using an approved flush tank or flushometer valve.

• Exceptions:

1. Listed fixtures that do not require water for their operation and are not connected to the water supply.
2. Where not deemed necessary for safety and sanitation by the Authority Having Jurisdiction.

601.2.1 Hot and Cold Water Required

- In occupancies where plumbing fixtures are installed for private use, hot water shall be required for bathing, washing, laundry, cooking purposes, dishwashing or maintenance.
- In occupancies where plumbing fixtures are installed for public use, hot water shall be required for bathing and washing purposes.
- This requirement shall not supersede the requirements for individual temperature control limitations for public lavatories and public and private bidets, bathtubs, whirlpool bathtubs, and shower control valves.

601.3 Identification of a Potable and Non-potable Water System

- In buildings where potable water and non-potable water systems are installed, each system shall be clearly identified in accordance with Section 601.3.1 through Section 601.3.5.

601.3.1 Potable Water

- Green background with white lettering.

601.3.2 Color and Information

- Each system shall be identified with a colored pipe or band and coded with paints, wraps, and materials compatible with the piping.

602.0 Unlawful Connections

602.1 Prohibited Installation

- 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 a portion of such piping from a tank, receptor, equipment, or plumbing fixture by reason of back siphonage, suction, or other cause, either during normal use and operation thereof, or where such tank, receptor, equipment, or plumbing fixture is flooded or subject to pressure exceeding the operating pressure in the hot or cold water piping.

602.3 Backflow Prevention

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

603.0 Cross-Connection Control

603.1 General

- Cross-connection control shall be provided in accordance with the provisions of this chapter. Devices or assemblies for protection of the public water system must be models approved by the department of health under WAC 246-290-490. The authority having jurisdiction shall coordinate with the local water purveyor where applicable in all matters concerning cross-connection control within the property lines of the premises.
- 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

603.2 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. Backflow prevention devices and assemblies shall comply with Table 603.2, except for specific applications and provisions as stated in Section 603.5.1 through 603.5.21.
- 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. Such devices or assemblies shall be tested in accordance with Section 603.4.2 and WAC 246-290-490. If found to be defective or inoperative, the device or assembly shall be replaced or repaired. 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.
- Testing shall be performed by a Washington state department of health certified backflow assembly tester

603.3 Backflow Prevention Devices, Assemblies, and Methods

- Backflow prevention devices, assemblies, and methods shall comply with Section 603.3.1 through Section 603.3.12.

603.3.1 Air Gap

- The minimum air gap to afford backflow protection shall be in accordance with Table 603.3.1.

FIXTURES	WHERE NOT AFFECTED BY SIDEWALLS ¹ (inches)	WHERE AFFECTED BY SIDEWALLS ² (inches)
Effective openings ³ not greater than ½ of an inch in diameter	1	1½
Effective openings ³ not greater than ¾ of an inch in diameter	1½	2¼
Effective openings ³ not greater than 1 inch in diameter	2	3
Effective openings ³ greater than 1 inch in diameter	Two times the diameter of effective opening	Three times the diameter of effective opening

Table 7: Minimum air gaps for water distribution
(Source: IAPMO/ANSI, UPC, 1 2021, table 603.3.1)

603.3.7 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.

603.3.8 Double Check Detector Fire Protection Backflow Prevention Assembly

- A double check valve backflow prevention assembly with a parallel detector assembly consisting of a water meter and a double check valve backflow prevention assembly (DC).

603.3.9 Reduced Pressure Detector Fire Protection Backflow Prevention Assembly

- A reduced pressure principle backflow prevention assembly with a parallel detector assembly consisting of a water meter and a reduced-pressure principle backflow prevention assembly (RP).

603.4 General Requirements

- Assemblies shall comply with listed standards and be acceptable to the Authority Having Jurisdiction, with jurisdiction over the selection and installation of backflow prevention assemblies.

603.4.1 Backflow Prevention Valve

- Where more than one 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.

603.4.2 Testing

- For devices and assemblies other than those regulated by the Washington department of health in conjunction with the local water purveyor for the protection of public water systems, the authority having jurisdiction shall ensure that the premise owner or responsible person shall have the backflow prevention assembly tested by a Washington state department of health certified backflow assembly tester:
 1. At the time of installation, repair or relocation; and
 2. At least on an annual schedule thereafter, unless more frequent testing is required by the authority having jurisdiction.

603.4.5 Hot Water Backflow Preventers

- Backflow preventers for hot water exceeding 110°F (43°C) shall be a type designed to operate at temperatures exceeding 110°F (43°C) without rendering a portion of the assembly inoperative.

603.4.7 Freeze Protection

- In cold climate areas, backflow assemblies and devices shall be protected from freezing with an outdoor enclosure that complies with ASSE 1060 or by a method acceptable to the Authority Having Jurisdiction.

603.5 Specific Requirements

- Specific requirements for backflow prevention shall comply with Section 603.5.1 through Section 603.5.21.

603.5.1 Atmospheric Vacuum Breaker

- Water closet and urinal flushometer valves shall be protected against backflow by an approved backflow prevention assembly, device, or method.
- Where the valves are equipped with an atmospheric vacuum breaker, the vacuum breaker shall be installed on the discharge side of the flushometer valve with the critical level not less than 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.

603.5.2 Ballcock

- Water closet and urinal tanks shall be equipped with a ballcock. The ballcock shall be installed with the critical level not less than 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 1 inch (25.4 mm) above the full opening of the overflow pipe.

603.5.3 Backflow Prevention

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

603.5.4 Heat Exchangers

- 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.
- Single-wall heat exchangers used in indirect-fired water heaters shall meet the requirements of Section 505.4.1.
- Double-wall heat exchangers shall separate the potable water from the heat-transfer medium by providing a space between the two walls that are vented to the atmosphere.

603.5.5 Water Supply Inlets

- Water supply inlets to tanks, vats, sumps, swimming pools, and other receptors shall be protected by one of the following means:
 1. An approved air gap.
 2. A listed vacuum breaker installed on the discharge side of the last valve with the critical level not less than 6 inches (152 mm) or in accordance with its listing.
 3. A backflow preventer suitable for the degree of hazard, installed in accordance with the requirements for that type of device or assembly as set forth in this chapter.

603.5.6 Protection from Lawn Sprinklers and Irrigation Systems.

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:

1. Atmospheric vacuum breaker (AVB).
2. Pressure vacuum breaker backflow prevention assembly (PVB).
3. Spill-resistant pressure vacuum breaker (SVB).
4. Reduced pressure principle backflow prevention assembly (RP).
5. A double check valve backflow prevention assembly (DC) may be allowed when approved by the water purveyor and the authority having jurisdiction.

603.5.7 Outlets with Hose Attachments

- Potable water outlets with hose attachments, other than water heater drains, boiler drains, and clothes washer connections, shall be protected by a nonremovable hose bibb-type backflow preventer, a nonremovable hose bibb-type vacuum breaker, or by an atmospheric vacuum breaker installed not less than 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.

603.5.8 Water-Cooled Equipment

- Water-cooled compressors, degreasers, or other water-cooled equipment shall be protected by a backflow preventer installed in accordance with the requirements of this chapter.
- Water-cooled equipment that produces backpressure shall be equipped with the appropriate protection.

603.5.9 Aspirators

- 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. Where 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.

603.5.10 Steam or Hot Water Boilers

- Potable water connections to steam or hot water boilers shall be protected by an air gap or a reduced pressure principle backflow preventer.

DEVICE, ASSEMBLY, OR METHOD ¹	APPLICABLE STANDARDS	DEGREE OF HAZARD				INSTALLATION ^{2,3}
		POLLUTION (LOW HAZARD)		CONTAMINATION (HIGH HAZARD)		
		BACK- SIPHONAGE	BACK- PRESSURE	BACK- SIPHONAGE	BACK- PRESSURE	
Air gap	ASME A112.1.2	X	—	X	—	See Table 603.3.1 in this chapter.
Air gap fittings for use with plumbing fixtures, appliances, and appurte- nances	ASME A112.1.3	X	—	X	—	Air gap fitting is a device with an internal air gap, and typical installation includes plumbing fixtures, appliances, and appurtenances. The critical level shall not be installed below the flood level rim.
Atmospheric vacuum breaker (consists of a body, checking member and atmospheric port)	ASSE 1001 or CSA B64.1.1	X	—	X	—	Upright position. Have outlet open to atmosphere. Minimum of 6 inches or listed distance above all downstream piping and flood level rim of receptor. ^{4,5}
Antisiphon fill valve (ballocks) for gravity water closet flush tanks and urinal tanks	ASSE 1002/ ASME A112.1002/ CSA B125.12	X	—	X	—	Installation of gravity water closet flush tank and urinal tanks with the fill valve installed with the critical level not less than 1 inch above the opening of the overflow pipe. ^{4,5}
Vacuum breaker wall hydrants, hose bibbs, freeze resistant, auto- matic draining type	ASSE 1019 or CSA B64.2.1.1	X	—	X	—	Installation includes wall hydrants and hose bibbs. Such devices are not for use under con- tinuous pressure conditions (means of shutoff downstream of device is prohibited). ^{4,5}
Hose connection vacuum breakers	ASSE 1011	X	—	X	—	Such devices are not for use under continuous pressure conditions. No valve downstream. ^{4,6}
Hose connection back- flow preventers	ASSE 1052	X	—	X	—	Such devices are not for use under continuous pressure conditions. ^{4,6}
Dual check backflow preventer	ASSE 1024	X	X	—	—	Installation does not include carbonated drink dispensers.
Dual check backflow preventer wall hydrants, freeze resistant	ASSE 1053	X	—	X	—	Such devices are not for use under continuous pressure conditions. ⁴
Freeze resistant sanitary yard hydrants	ASSE 1057	X	—	X	—	Such devices are not for use under continuous pressure conditions. ⁴

**Table 8: Backflow
prevention devices,
assemblies, and methods**
(Source: IAPMO/ANSI, UPC, 1
2021, table 603.3.1)

603.5.11 Non-potable Water Piping

- In cases where it is impractical to correct individual cross-connections on the domestic waterline, 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 waterline.
- Where possible, portions of the non-potable waterline shall be exposed, and exposed portions shall be properly identified in a manner satisfactory to the Authority Having Jurisdiction.
- Each outlet on the non-potable waterline that is permitted to be used for drinking or domestic purposes shall be posted: "CAUTION: NONPOTABLE WATER, DO NOT DRINK."



Figure 7: Non-potable water

603.5.12 Beverage Dispensers

- Potable water supply to carbonators shall be protected by a listed reduced pressure principle backflow preventer as approved by the authority having jurisdiction for the specific use. The backflow preventer shall comply with Section 603.4.3. The piping downstream of the backflow preventer shall not be of copper, copper alloy, or other material that is affected by carbon dioxide.

603.5.13 Deck-Mounted and Equipment-Mounted Vacuum Breakers

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

603.5.14 Protection from Fire Systems

- Except as provided in Section 603.5.14.1 and Section 603.5.14.2, 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 or townhouse residential sprinkler systems, piped in materials approved for potable water distribution systems shall be protected from backpressure and backsiphonage by one of the following testable devices:
 - 1) Double check valve backflow prevention assembly(DC)
 - 2) Double check detector fire protection backflow prevention assembly
 - 3) Reduced pressure principle backflow prevention assembly (RP)
 - 4) Reduced pressure detector fire protection backflow prevention assembly

603.5.14.1 Fire Department Connection

- Where fire protection systems supplied from a potable water system include a fire department (siamese) connection that is located less than 1700 feet (518.2 m) from a non-potable water source that is capable of being 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 principle backflow prevention assembly (RP)
 - 2) Reduced pressure detector fire protection back-flow prevention assembly. 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.

603.5.14.2 Chemicals

- 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 principle backflow prevention assembly (RP)
 - 2) Reduced pressure detector fire protection back-flow prevention assembly

603.5.14.3 Hydraulic Design

- Where 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.
- Where such devices are retro-fitted 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.

603.5.15 Health Care or Laboratory Areas

- Vacuum breakers for washer-hose bedpans shall be located not less than 5 feet (1524 mm) above the floor. Hose connections in health care or laboratory areas shall be not less than 6 feet (1829 mm) above the floor.

603.5.16 Special Equipment

- Portable cleaning equipment and dental vacuum pumps shall be protected from backflow by an air gap, an atmospheric vacuum breaker, a spill-resistant vacuum breaker, or a reduced pressure principle backflow preventer.

603.5.18 Pure Water Process Systems

- The water supply to a pure water process system, such as dialysis water systems, semiconductor washing systems, and similar process piping systems, shall be protected from backpressure and backsiphonage by a reduced-pressure principle backflow preventer.

603.5.18.1 Dialysis Water Systems

- The individual connections of the dialysis related equipment to the dialysis pure water system shall not require additional backflow protection.

604.0 Materials

604.1 Pipe, Tube, and Fittings

- Pipe, tube, fittings, solvent cement, thread sealants, solders, and flux used in potable water systems intended to supply drinking water shall comply with NSF 61.
- Where pipe fittings and valves are made from copper alloys containing more than 15 percent zinc by weight and are used in plastic piping systems, they shall be resistant to dezincification and stress corrosion cracking in compliance with NSF 14.



Figure 17: Pipe, tube, fittings and associated accessories used to supply drinking water shall comply with NSF 61

- 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.
- Materials for building water piping and building supply piping shall comply with the applicable standards referenced in Table 604.1.

Table 9: Materials for building supply and water distribution piping and fittings

(Source: IAPMO/ANSI, UPC, 1 2021, table 603.3.1)

MATERIAL	BUILDING SUPPLY PIPE AND FITTINGS	WATER DISTRIBUTION PIPE AND FITTINGS	REFERENCED STANDARD(S) PIPE	REFERENCED STANDARD(S) FITTINGS
Copper and Copper Alloys	X	X	ASTM B42, ASTM B43, ASTM B75, ASTM B88, ASTM B135, ASTM B251, ASTM B302, ASTM B447	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.24, ASME B16.50, ASME B16.51, ASSE 1061, ASTM F3226, IAPMO PS 117
CPVC	X	X	ASTM D2846, ASTM F441, ASTM F442, CSA B137.6	ASSE 1061, ASTM D2846, ASTM F437, ASTM F438, ASTM F439, ASTM F1970, CSA B137.6
CPVC-AL-CPVC	X	X	ASTM F2855	ASTM D2846
Ductile-Iron	X	X	AWWA C151	ASME B16.4, AWWA C110, AWWA C153
Galvanized Steel	X	X	ASTM A53	—
Malleable Iron	X	X	—	ASME B16.3
PE	X ^a	—	ASTM D2339, ASTM D2737, ASTM D3035, AWWA C901, CSA B137.1	ASTM D2609, ASTM D2683, ASTM D3261, ASTM F1055, CSA B137.1
PE-AL-PE	X	X	ASTM F1282, CSA B137.9	ASTM F1282, ASTM F1974, CSA B137.9
PE-AL-PEX	X	X	ASTM F1986	ASTM F1986
PE-RT	X	X	ASTM F2769, CSA B137.18	ASSE 1061, ASTM D3261, ASTM F1055, ASTM F1807, ASTM F2098, ASTM F2159, ASTM F2735, ASTM F2769, CSA B137.18
PEX	X	X	ASTM F876, CSA B137.5, AWWA C904 ^b	ASSE 1061, ASTM F877, ASTM F1807, ASTM F1960, ASTM F2098, ASTM F2159, ASTM F2735, CSA B137.5
PEX-AL-PEX	X	X	ASTM F1281, CSA B137.10	ASTM F1281, ASTM F1974, ASTM F2434, CSA B137.10
PP	X	X	ASTM F2389, CSA B137.11	ASTM F2389, CSA B137.11
PVC	X ^a	—	ASTM D1785, ASTM D2241, AWWA C900	ASTM D2464, ASTM D2466, ASTM D2467, ASTM F1970, AWWA C907
Stainless Steel	X	X	ASTM A269, ASTM A312, ASTM A554, ASTM A778	ASTM F3226, IAPMO PS 117

604.3 Copper or Copper Alloy Tube

- Copper or copper alloy tube for water piping shall have a weight of not less than Type L.
- Exception: Type M copper or copper alloy tubing shall be permitted to be used for water piping where piping is aboveground in, or on, a building or underground outside of structures.

604.4 Hard-Drawn Copper or Copper Alloy Tubing

- Hard-drawn copper or copper alloy tubing for water supply and distribution in addition to the required incised marking shall be marked in accordance with ASTM B88.
- The colors shall be: Type K, green; Type L, blue; and Type M, red.

604.5 Flexible Connectors

- Flexible water connectors shall be installed in readily accessible locations, and where under continuous pressure shall comply with ASME A112.18.6/CSA B125.6.
- Flexible water connectors with an excess flow shutoff device shall comply with CSA B125.5/IAPMO Z600.

604.6 Cast-Iron Fittings

- Cast-iron fittings up to and including 2 inches (50 mm) in size, where used in connection with potable water piping, shall be galvanized.



Figure 18: Cast-iron fittings up to 2 inches in size used in potable water systems shall be galvanized

604.9 Epoxy Coating

- The epoxy coating used on existing, underground steel building supply piping shall comply with NSF 61 and AWWA C210.

604.10 Plastic Materials

- Approved plastic materials shall be permitted to be used in building supply piping, provided that where metal building supply piping is used for electrical grounding purposes, replacement piping, therefore, shall be of like materials.
- Exception: Where a grounding system acceptable to the Authority Having Jurisdiction is installed, inspected, and approved, the metallic pipe shall be permitted to be replaced with nonmetallic pipe.

604.10.1 Tracer Wire

- Plastic materials for building supply piping outside underground shall have an electrically continuous corrosion-resistant blue insulated copper tracer wire, or other approved conductor installed adjacent to the piping.
- Access shall be provided to the tracer wire, or the tracer wire shall terminate aboveground at each end of the nonmetallic piping.
- The tracer wire size shall be not less than 14 AWG, and the insulation type shall be suitable for direct burial.

604.14 Plastic Pipe Termination.

- Plastic water service piping may terminate within a building, provided the connection to the potable water distribution system shall be made as near as is practical to the point of entry and shall be accessible. Barbed insert fittings with hose clamps are prohibited as a transition fitting within the building.

605.0 Joints and Connections

605.1 Copper or Copper Alloy Pipe, Tubing, and Joints

- Joining methods for copper or copper alloy pipe, tubing, and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.1.1 through Section 605.1.5.

605.1.2 Flared Joints

- Flared joints for soft copper or copper alloy water tubing shall be made with fittings that comply with the applicable standards referenced in Table 604.1.
- Pipe or tubing shall be cut square using an appropriate tubing cutter. The tubing shall be reamed to full inside diameter, resized to round, and expanded with a proper flaring tool.

605.1.5 Threaded Joints

- Threaded joints for copper or copper alloy pipe shall be made with pipe threads that comply with ASME B1.20.1.
- Thread sealant tape or compound shall be applied only on male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

605.2 CPVC Plastic Pipe and Joints

- CPVC plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.2.1 through Section 605.2.3.

605.3 CPVC/AL/CPVC Plastic Pipe and Joints

- Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.3.1 or Section 605.3.2.

605.3.2 Mechanical Joints

- Mechanical joints shall include flanged, grooved, and push fit fittings.

605.3.2.1 Push Fit Fittings

- Removable and nonremovable push fit fittings that employ a quick assembly push fit connector shall comply with ASSE 1061.

605.5 Galvanized Steel Pipe and Joints

- Galvanized steel pipe and fitting joining methods shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.5.1 or Section 605.5.2.

605.5.1 Mechanical Joints

- Mechanical joints shall be made with an approved and listed elastomeric gasket.

605.5.2 Threaded Joints

- Threaded joints shall be made with pipe threads that comply with ASME B1.20.1. Thread sealant tape or compound shall be applied only on male threads, and such material shall be of approved types, insoluble in water, and nontoxic.

605.7 PE-AL-PE Plastic Pipe/Tubing and Joints

- PEAL-PE plastic pipe or tubing and fitting joining methods shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.7.1 and Section 605.7.1.1.

605.7.1.1 Compression Joints

- Compression joints for PE-AL-PE pipe or tubing and fittings shall be joined through the compression of a split ring, by a compression nut around the circumference of the pipe.
- The compression nut and split ring shall be placed around the pipe. The ribbed end of the fitting shall be inserted into the pipe until the pipe contacts the shoulder of the fitting.
- Position and compress the split ring by tightening the compression nut onto the insert fitting.

605.8 PE-RT

- Polyethylene of raised temperature (PE-RT) tubing and fitting joining methods and shall comply with Section 605.8.1.

605.8.1 Mechanical Joints

- Fittings for PE-RT tubing shall comply with the applicable standards listed in Table 604.1. Mechanical joints for PE-RT tubing shall be installed in accordance with the manufacturer's installation instructions.

605.11 Polypropylene (PP) Piping and Joints

PP pipe and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.11.1 through Section 605.11.3.

605.11.1 Heat-Fusion Joints

- Heat-fusion joints for polypropylene (PP) pipe and fitting joints shall be installed with socket-type heat-fused polypropylene fittings, fusion outlets, butt-fusion polypropylene fittings or pipe, or electro-fusion polypropylene fittings.
- Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F2389 or CSA B137.11.

605.11.2 Mechanical and Compression Sleeve Joints

- Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's installation instructions.

605.11.3 Threaded Joints

- PP pipe shall not be threaded. PP transition fittings for connection to other piping materials shall only be threaded by use of copper alloy or stainless steel inserts molded in the fitting.

605.12 PVC Plastic Pipe and Joints

- PVC plastic pipe and fitting joining methods shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.12.1 through Section 605.12.3.
- PVC piping shall not be exposed to direct sunlight unless the piping does not exceed 24 inches (610 mm) and is wrapped with not less than 0.04 of an inch (1.02 mm) thick tape or otherwise protected from UV degradation.

605.12.2 Solvent Cement Joints

- Solvent cement joints for PVC pipe and fittings shall be clean from dirt and moisture. Pipe shall be cut square and pipe shall be deburred.
- Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply primer purple in color that complies with ASTM F656.
- Primer shall be applied to the surface of the pipe and fitting is softened. Solvent cement that complies with ASTM D2564 shall be applied to all joint surfaces.
- Joints shall be made while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly.

605.13 Stainless Steel Pipe and Joints

- Joining methods for stainless steel pipe and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 605.13.1 or Section 605.13.2.

605.13.1 Mechanical Joints

- Mechanical joints shall be designed for their intended use. Such joints shall include compression, flanged, grooved, press-connect, and threaded.

606.0 Valves

606.1 General

- Valves up to and including 2 inches (50 mm) in size shall be copper alloy or other approved material. Sizes exceeding 2 inches (50 mm) shall be permitted to have cast iron or copper alloy bodies.
- Each gate or ball valve shall be a full-way or full-port type with working parts of the noncorrosive material.
- Valves carrying water used in potable water systems intended to supply drinking water shall comply with the requirements of NSF 61 and ASME A112.4.14, ASME B16.34, ASTM F1970, ASTM F2389, AWWA C500, AWWA C504, AWWA C507, IAPMO Z1157, MSS SP-67, MSS SP-70, MSS SP-71, MSS SP-72, MSS SP-78, MSS SP80, MSS SP-110, MSS SP-122, or NSF 359.

606.3 Multidwelling Units

- In multidwelling units, one or more shutoff valves shall be provided in each dwelling unit so that the water supply to a 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.

606.4 Multiple Openings.

- Valves used to control two or more openings shall be fullway gate valves, ball valves, or other approved valves designed and approved for the service intended.

606.6 Accessible

- Required shutoff or control valves shall be accessible.

606.7 Multiple Fixtures

- A single control valve shall be installed on a water supply line ahead of an automatic metering valve that supplies a battery of fixtures.

607.0 Potable Water Supply Tanks

607.1 General

- Potable water supply tanks shall be installed in accordance with the manufacturer's installation instructions and supported in accordance with the building code.

607.2 Potable Water Tanks

- Potable water supply tanks, interior tank coatings, or tank liners intended to supply drinking water shall comply with NSF 61.

607.5 Valves

- Pressurized tanks shall be provided with a listed pressure-relief valve installed in accordance with the manufacturer's installation instructions.
- The relief valve shall be discharged in accordance with Section 608.5.
- Where a potable water supply tank is located above the fixtures, appliances, or system components it serves, it shall be equipped with a vacuum relief valve that complies with CSA Z21.22.



Figure 19: Pressurized tanks shall be provided with a listed pressure-relief valve

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

608.1 Inadequate Water Pressure

- Where the water pressure in the main or other source of supply will not provide a residual water pressure of not less than 15 pounds force per square inch (psi) (103 kPa), after allowing for friction and other pressure losses, a tank and a pump or other means that will provide said 15 psi (103 kPa) pressure shall be installed.
- Where fixtures, fixture fittings, or both are installed that, require residual pressure exceeding 15 psi (103 kPa), that minimum residual pressure shall be provided.

608.5 Discharge Piping.

- The discharge piping serving a temperature relief valve, pressure relief valve or combination of both shall have no valves, obstructions or means of isolation and be provided with the following:
 1. Not less than the size of the valve outlet and shall discharge full size to the flood level of the area receiving the discharge and pointing down.
 2. Materials shall be rated at not less than the operating temperature of the system and approved for such use or shall comply with ASME A112.4.1. Materials shall be straight, rigid lengths only, without coils or flexes.
 3. Discharge pipe shall discharge independently by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) and not less than 6 inches (152 mm) above the ground pointing downwards.
 4. Discharge in such a manner that does not cause personal injury or structural damage.
 5. No part of such discharge pipe shall be trapped or subject to freezing.
 6. The terminal end of the pipe shall not be threaded.
 7. Discharge from a relief valve into a water heater pan shall be prohibited.
 8. The discharge termination point shall be readily observable.
- **EXCEPTION:** Where no drainage was provided, replacement water heating equipment shall only be required to provide a drain pointing downward from the relief valve to extend between two (2) feet (610 mm) and six (6) inches (152 mm) from the floor. No additional floor drain need be provided.

609.0 Installation, Testing, Unions, and Location.

609.5 Unions

- Unions shall be installed in the water supply piping not more than 12 inches (305 mm) of regulating equipment, water heating, conditioning tanks, and similar equipment that requires service by removal or replacement in a manner that will facilitate its ready removal.

609.9 Low-Pressure Cutoff Required on Booster Pumps for Water Distribution Systems

- Where a booster pump (excluding a fire pump) is connected to a building supply or underground water pipe, a low-pressure cutoff switch on the inlet side of the pump shall be installed not more than 5 feet (1524 mm) of the inlet.
- The cutoff switch shall be set for not less than 10 psi (69 kPa). A pressure gauge shall be installed between the shutoff valve and the pump.

609.12 Insulation of Potable Water Piping.

- Domestic water piping within commercial buildings shall be insulated in accordance with Section C403.2.8 and Table C403.2.8 or Section C404.6 of the Washington State Energy Code, as applicable.

Table 10: Flushometer fixture units for water sizing using table 610.3

(Source: IAPMO/ANSI, UPC, 1 2021, table 610.10)

FIXTURE CATEGORY: WATER CLOSET WITH 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 WITH 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

610.0 Size of Potable Water Piping

610.1 Size

- 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 out-lined in this section.
- Water piping systems shall be designed to ensure that the maximum velocities allowed by the code and the applicable standard are not exceeded.

610.2 Pressure Loss

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

610.3 Quantity of Water

- The quantity of water required to be supplied to every plumbing fixture shall be represented by fixture units, as shown in Table 610.3.

APPLIANCES, APPURTENANCES OR FIXTURES ²	MINIMUM FIXTURE BRANCH PIPE SIZE ¹ (inches)	PRIVATE	PUBLIC	ASSEMBLY ⁴
Bath tub or Combination Bath/Shower (BIB)	1/2	4.0	4.0	---
1/2 inch Bath tub Fill Valve	3/8	10.0	10.0	---
Bidet	1/2	1.0	---	---
Clothes Washer	1/2	4.0	4.0	---
Dental Unit, compidor	1/2	---	1.0	---
Dishwasher, domestic	1/2	1.5	1.5	---
Drinking Fountain or Water Cooler	1/2	0.5	0.5	0.75
Hose Bibb	1/2	2.5	2.5	---
Hose Bibb, each additional ³	1/2	1.0	1.0	---
Lavatory	1/2	1.0	1.0	1.0
Lawn Sprinkler, each head ⁵	---	1.0	1.0	---
Mobile Home, each (minimum)	---	12.0	---	---
Sinks	---	---	---	---
Bar	1/2	1.0	2.0	---
Clinical Faucet	1/2	---	3.0	---
Clinical Flushometer Valve with or without faucet	1	---	8.0	---
Kitchen, domestic with or without dishwasher	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	3/8	See Footnote ⁷		
Urinal, greater than 1.0 GPF Flushometer Valve	3/8	See Footnote ⁷		
Urinal, flush tank	1/2	2.0	2.0	3.0
Urinal with Drain Cleansing Action	1/2	1.0	1.0	1.0
Wash Fountain, circular spray	3/8	---	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		

Table 4: Water Supply Fixture Units (WSFU) and Minimum Fixture Branch Pipe Sizes

(Source: IAPMO/ANSI, UPC, 1 2021, Table 610.3)

610.4 Sizing Water Supply and Distribution Systems.

- Systems within the range of Table 610.4 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.

Section 610.5

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

610.7 Conditions for Using Table 610.4

- On a proposed water piping installation sized using Table 610.4, the following conditions shall be determined:
 - 1) Total number of fixture units as determined from Table 610.3, Equivalent Fixture Units, for the fixtures to be installed.
 - 2) Developed length of supply pipe from meter to the 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 another 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.

610.8 Size of Meter and Building Supply Pipe Using Table 610.4.

- 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.
 - 2) Add or subtract depending on positive or negative elevation change, 1/2 psi (3.4 kPa) for each foot (305 mm) of difference in elevation between such source of supply and the 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 610.4.
 - 4) Select the “length” column that is equal to or longer than the required length.
 - 5) Follow down the column to a fixture unit value equal to or exceeding 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.

610.10 Sizing for Flushometer Valves

- Where using Table 610.4 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 610.10.
- Piping supplying a flushometer valve shall be not less in size than the valve inlet.
- Where using Table 610.10 to size water piping, care shall be exercised to assign flushometer fixture units based on the number and category of fixtures served.

FIXTURE CATEGORY: WATER CLOSET WITH 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 WITH 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

Table 5: Flushometer Fixture Units for Water Sizing

(Source: IAPMO/ANSI, UPC, 1 2021, Table 610.10)

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 not exceed 8 feet per second (ft/s) (2.4 m/s) in cold water and 5 ft/s (1.5 m/s) in hot water.
- ##### 610.12.2 Tubing Systems Using Copper Fittings.
- Maximum velocities through copper fittings in tubing other than copper shall not exceed 8 ft/s (2.4 m/s) in cold water and 5 ft/s (1.5 m/s) in hot water.

610.13 Exceptions

- The provisions of this section relative to the 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 fixtures.
 - 3) Replacement of existing fixtures or appliances.
 - 4) Piping that 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) The size and material of irrigation water piping installed outside of a building or structure and separated from the potable water supply by means of an approved air gap or backflow prevention device are not regulated by this code.

611.0 Drinking Water Treatment Units

611.1 Application

- Drinking water treatment units shall comply with NSF 42 or NSF 53. Water softeners shall comply with NSF 44. Ultraviolet water treatment systems shall comply with NSF 55. Reverse osmosis drinking water treatment systems shall comply with NSF 58. Drinking water distillation systems shall comply with NSF 62.
- The owner of a building that serves potable water to twenty-five or more people at least sixty or more days per year and that installs drinking water treatment units including, but not limited to, the treatment units in Section 611.1, may be regulated (as a Group A public water system) by the Washington state department of health under chapter 246-290 WAC. See Washington state department of health publication 331-488 for guidance.

611.1.1 Alkaline Water Treatment

- Alkaline water treatment devices shall comply with IAPMO IGC 322.

611.1.2 Scale Reduction Devices

- Scale reduction devices shall comply with IAPMO Z601.

Table 6: Drinking Water Treatment Units
(Source: IAPMO/ANSI, UPC, 1 2021, Table 611.1)

APPLICATION	RESIDENTIAL		COMMERCIAL
	POINT OF USE	POINT OF ENTRY	
Aesthetic Contaminant Reduction (filters)	NSF 42	NSF 42	ASSE 1087 and NSF 42*
Health Related Contaminant Reduction (filters)	NSF 53	NSF 53	ASSE 1087 and NSF 53*
Water Softener	–	NSF 44	ASSE 1087
Ultraviolet Water Treatment	NSF 55	NSF 55	ASSE 1087
Reverse Osmosis	NSF 58	NSF 61	ASSE 1087
Distillation	NSF 62	NSF 62	ASSE 1087

* Required for commercial modular systems only.

611.2 Air Gap Discharge

- Discharge from drinking water treatment units shall enter the drainage system through an air gap in accordance with Table 603.3.1 or an air gap device that complies with Table 603.2, NSF 58, or IAPMO PS 65.

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.

611.4 Sizing of Residential Softeners

- Residential-use water softeners shall be sized in accordance with Table 611.4

TABLE 611.4
SIZING OF RESIDENTIAL WATER SOFTENERS¹

REQUIRED SIZE OF SOFTENER CONNECTION (Inches)	NUMBER OF BATHROOM GROUPS SERVED ¹
3/4	up to 2 ²
1	up to 4 ³

For SI units: 1 inch = 25 mm

Notes:

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.

Table 7: Sizing of Residential Water Softeners

(Source: IAPMO/ANSI, UPC, 1 2021, Table 611.4)

612.0 Residential Fire Sprinkler Systems

612.1 General.

- Where residential fire sprinkler systems are installed, they shall be installed in accordance with the International Building Code or International Residential Code.

Sections 612.2 through 612.7.2 are not adopted.

- Please pause the presentation and watch the video.

CHAPTER 7 SANITARY DRAINAGE

This chapter regulates the design and installation of sanitary drainage systems to ensure they will work as intended.

Drainage piping should not be oversized nor undersized, and constructed of approved materials to guard against fouling, deposit of solids, clogging, and with cleanouts so arranged that the pipes may be readily cleaned.

The purpose of the sanitary drainage system is to remove effluent discharged from plumbing fixtures and other equipment to an approved point of disposal, such as a public sanitary system or private sewage disposal system.

(2018)

701.2 Drainage Piping

- Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.2 except that:
 - [...] These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

(2021)

701.2 Drainage Piping

- Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.2 except that:
 - [...] Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.

(2018)

704.3 Commercial Sinks

- [...] A floor drain shall be provided adjacent to the fixture, and the fixture shall be connected on the sewer side of the floor drain trap, provided that no other drainage line is connected between the floor drain waste connection and fixture drain. The fixture and floor drain shall be trapped and vented in accordance with this code.

(2021)

704.3 Commercial Sinks

- [...] A floor drain shall be provided adjacent to the fixture and ~~the fixture~~ shall be connected on the sewer side of the ~~floor drain trap, sink, , provided that~~ No other drainage line ~~is shall be~~ connected between the floor drain waste connection and the fixture drain. The fixture and floor drain shall be trapped and vented in accordance with this code.

701.0 General

701.1 Applicability

- This chapter shall govern the materials, design, and installation of sanitary drainage systems and building sewers.

701.2 Drainage Piping.

- Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.1 except that:
 1. No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept not less than 6 inches (152 mm) above ground.
 2. ABS and PVC DWV piping installations shall be installed in accordance with applicable standards in Table 701.2. Except for individual single family dwelling units, materials exposed within ducts or plenums shall have a maximum flame-spread index of 25 and a maximum smoke developed index of 50, when tested in accordance with ASTM E-84 and UL 723.
 3. No vitrified clay pipe or fittings shall be used above ground or where pressurized by a pump or ejector. They shall be kept not less than 12 inches (305 mm) below ground.
 4. Copper tube for drainage and vent piping shall have a weight of not less than that of copper drainage tube type DWV.
 5. Stainless steel 304 pipe and fittings shall not be installed underground and shall be kept not less than 6 inches (152 mm) above ground.
 6. Cast-iron soil pipe and fittings shall be listed and tested in accordance with standards referenced in Table 701.2. Such pipe and fittings shall be marked with country of origin and identification of the original manufacturer in addition to markings required by referenced standards.

701.3 Drainage Fittings

- Materials for drainage fittings shall comply with the applicable standards referenced in Table 701.2 of the same diameter as the piping served, and such fittings shall be compatible with the type of pipe used.

701.5 Lead

- Sheet lead shall comply with the following:
 - For safe pans – not less than 4 pounds per square foot (lb/ft²) (19 kg/m²) or 1/16 of an inch (1.6 mm) thick.
 - For flashings or vent terminals – not less than 3 lb/ft² (15 kg/m²) or 0.0472 of an inch (1.2 mm) thick.
 - Lead bends and lead traps shall be not less than 1/8 of an inch (3.2 mm) in wall thickness.

701.6 Caulking Ferrules

- Caulking ferrules shall be manufactured from copper or copper alloy and shall be in accordance with Table 701.6.

PIPE SIZE (inches)	INSIDE DIAMETER (inches)	LENGTH (inches)	MINIMUM WEIGHT EACH	
			pounds	ounces
2	2¼	4½	1	0
3	3¼	4½	1	12
4	4¼	4½	2	8

Table 11: Caulking ferrules

(Source: IAPMO/ANSI, UPC, 1 2021, table 701.6)

701.7 Soldering Bushings

- Soldering bushings shall be of copper or copper alloy and shall be in accordance with Table 701.7.

PIPE SIZE (inches)	MINIMUM WEIGHT EACH		PIPE SIZE (inches)	MINIMUM WEIGHT EACH	
	pounds	ounces		pounds	ounces
1¼	0	6	2½	1	6
1½	0	8	3	2	0
2	0	14	4	3	8

Table 12: Soldering bushings
(Source: IAPMO/ANSI, UPC, 1 2021, table 701.7)

702.0 Fixture Unit Equivalents

702.1 Trap Size

- The unit equivalent of plumbing fixtures shown in Table 702.1 shall be based on the size of the trap required, and the unit equivalent of fixtures and devices not shown in Table 702.1 shall be based on the size of trap or trap arm.
- Maximum drainage fixture units for a fixture trap and trap arm loadings for sizes up to 4 inches (100 mm) shall be in accordance with Table 702.1(1).

MATERIAL	UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	BUILDING SEWER PIPE AND FITTINGS	REFERENCED STAND- DARD(S) PIPE	REFERENCED STANDARD(S) FITTINGS
ABS (Schedule 40)	X	X	X	ASTM D2661, ASTM D2680*	ASME A12.4.4, ASTM D2661, ASTM D2680*
Cast-Iron	X	X	X	ASTM A74, ASTM A888, CISPI 301	ASME B16.12, ASTM A74, ASTM A888, CISPI 301
Co-Extruded ABS (Schedule 40)	X	X	X	ASTM F628	ASME A12.4.4, ASTM D2661, ASTM D2680*
Co-Extruded Composite (Schedule 40)	X	X	X	ASTM F1488	ASME A12.4.4, ASTM D2661, ASTM D2665, ASTM F794*, ASTM F1866
Co-Extruded PVC (Schedule 40)	X	X	X	ASTM F891, ASTM F1760	ASME A12.4.4, ASTM D2665, ASTM F794*, ASTM F1336*, ASTM F1866
Copper and Copper Alloys (Type DWV)	X	X	X	ASTM B43, ASTM B75, ASTM B251, ASTM B302, ASTM B306	ASME B16.23, ASME B16.29
Galvanized Malleable Iron	—	X	—	—	ASME B16.3

**Table 13: Materials for
drain, waste, vent pipe
and fittings**

(Source: IAPMO/ANSI, UPC, 1
2021, table 701.2)

PLUMBING APPLIANCES, APPURTENANCES, OR FIXTURES	MINIMUM SIZE TRAP AND TRAP ARM ¹ (inches)	PRIVATE	PUBLIC	ASSEMBLY ⁶
Bathtub or Combination Bath/Shower	1½	2.0	2.0	—
Bidet	1¼	1.0	—	—
Bidet	1½	2.0	—	—
Clothes Washer, domestic, standpipe ⁵	2	3.0	3.0	3.0
Dental Unit, cuspidor	1¼	—	1.0	1.0
Dishwasher, domestic, with independent drain ²	1½	2.0	2.0	2.0
Drinking Fountain or Water Cooler	1¼	0.5	0.5	1.0
Food Waste Disposer, commercial	2	—	3.0	3.0
Floor Drain, emergency	2	—	0.0	0.0
Floor Drain (for additional sizes see Section 702.0)	2	2.0	2.0	2.0
Shower, single-head trap	2 ⁹	2.0	2.0	2.0
Multi-head, each additional	2	1.0	1.0	1.0
Lavatory	1¼	1.0	1.0	1.0
Lavatories in sets	1½	2.0	2.0	2.0
Washfountain	1½	—	2.0	2.0
Washfountain	2	—	3.0	3.0
Mobile Home, trap	3	12.0	—	—
Receptor, indirect waste ^{1,3}	1½	See footnote ^{1,3}		
Receptor, indirect waste ^{1,4}	2	See footnote ^{1,4}		
Receptor, indirect waste ¹	3	See footnote ¹		
Sinks	—	—	—	—
Bar	1½	1.0	—	—
Bar ²	1½	—	2.0	2.0
Clinical	3	—	6.0	6.0
Commercial with food waste ²	1½	—	3.0	3.0

Table 14: Drainage fixture unit values (DFU)

(Source: IAPMO/ANSI, UPC, 1 2021, table 702.1)

Exam Room	1½	—	1.0	—
Special Purpose ²	1½	2.0	3.0	3.0
Special Purpose	2	3.0	4.0	4.0
Special Purpose	3	—	6.0	6.0
Kitchen, domestic ² (with or without food waste disposer, dishwasher, or both)	1½	2.0	2.0	—
Laundry ² (with or without discharge from a clothes washer)	1½	2.0	2.0	2.0
Service or Mop Basin	2	—	3.0	3.0
Service or Mop Basin	3	—	3.0	3.0
Service, flushing rim	3	—	6.0	6.0
Wash, each set of faucets	—	—	2.0	2.0
Nonwater Urinal with Drain Cleansing Action	2	1.0	1.0	1.0
Urinal, integral trap 1.0 GPF ²	2	2.0	2.0	5.0
Urinal, integral trap greater than 1.0 GPF	2	2.0	2.0	6.0
Urinal, exposed trap ²	1½	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank ⁶	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank ⁶	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve ⁶	3	3.0	4.0	6.0
Water Closet, greater than 1.6 GPF Gravity Tank ⁶	3	4.0	6.0	8.0
Water Closet, greater than 1.6 GPF Flushometer Valve ⁶	3	4.0	6.0	8.0

Table 14 (Cont'd): Drainage fixture unit values (DFU)

(Source: IAPMO/ANSI, UPC, 1 2021, table 702.1)

SIZE OF TRAP AND TRAP ARM (inches)	DRAINAGE FIXTURE UNIT VALUES (DFU)
1¼	1 unit
1½	3 units
2	4 units
3	6 units
4	8 units

Table 15: Maximum drainage fixture units for a trap and trap arm

(Source: IAPMO/ANSI, UPC, 1 2021, table 702.1(1))

703.0 Size of Drainage Piping

703.1 Minimum Size

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

703.2 Maximum Number of Fixture Units

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

704.0 Fixture Connections (Drainage)

704.1 Inlet Fittings

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

704.2 Single Vertical Drainage Pipe

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

704.3 Commercial Sinks.

- Except where specifically required to be connected indirectly to the drainage system, or when first approved by the authority having jurisdiction, all plumbing fixtures, drains, appurtenances, and appliances shall be directly connected to the drainage system of the building or premises.

705.0 Joints and Connections

705.1 ABS and ABS Co-Extruded Plastic Pipe and Joints

- Joining methods for ABS plastic pipe and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 705.1.1 through Section 705.1.3.

705.1.1 Mechanical Joints

- Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint.
- The push-on joint shall include an elastomeric gasket that complies with ASTM D3212 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal.

705.1.3 Threaded Joints

- Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded. Molded threads on adapter fittings for the transition to threaded joints shall be permitted.
- Thread sealant compound shall be applied to male threads, insoluble in water, and nontoxic.
- The joint between the pipe and transition fitting shall be of the solvent cement type.
- Caution shall be used during assembly to prevent over tightening of the ABS components once the thread sealant compound has been applied.



Figure 20: Threads shall comply with ASME B1.20.1

705.6 PVC and PVC Co-Extruded Plastic Pipe and Joining Methods

- Joining methods for PVC plastic pipe and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 705.6.1 through Section 705.6.3.

705.6.1 Mechanical Joints

- Mechanical joints shall be designed to provide a permanent seal and shall be of the mechanical or push-on joint type.
- The push-on joint shall include an elastomeric gasket that complies with ASTM D3212 and shall provide a compressive force against the spigot and socket after assembly to provide a permanent seal.

705.6.3 Threaded Joints

- Threads shall comply with ASME B1.20.1. A minimum of Schedule 80 shall be permitted to be threaded. Molded threads on adapter fittings for the transition to threaded joints shall be permitted.
- Thread sealant compound that is compatible with the pipe and fitting, insoluble in water and nontoxic shall be applied to male threads.
- The joint between the pipe and transition fitting shall be of the solvent cement type.
- Caution shall be used during assembly to prevent over tightening of the PVC components once the thread sealant has been applied. Female PVC threaded fittings shall be used with plastic male threads only.

707.0 Cleanouts

707.1 Plug

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

SIZE OF PIPE (inches)	SIZE OF CLEANOUT (inches)	THREADS (per inches)
1½	1½	11½
2	1½	11½
2½	2½	8
3	2½	8
4 & larger	3½	8

Table 16: Cleanouts

(Source: IAPMO/ANSI, UPC, 1 2021, table 707.1)

707.2 Approved

- Each cleanout fitting and each cleanout plug or cap shall be of an approved type. A list of approved standards for cleanouts are referenced in Table 707.2.



MATERIAL	STANDARD
ABS	ASTM D2661, CSA B79, IAPMO IGC 78, IAPMO IGC 224
Cast Iron	ASME A112.36.2, ASTM A888, CISPI 301, CSA B79, IAPMO IGC 224
Copper or Copper Alloy	ASME A112.36.2, CSA B79
Ductile Iron	CSA B79
Elastomers	CSA B79, IAPMO PS 90
Polyethylene (PE)	CSA B79
Polypropylene (PP)	CSA B79
PVC	ASTM D2665, CSA B79, IAPMO IGC 78, IAPMO IGC 224
Polyvinylidene Fluoride (PVDF)	CSA B79
Stainless Steel	CSA B79

Table 17: Cleanout materials for drain, waste, and vent

(Source: IAPMO/ANSI, UPC, 1 2021, table 707.2)

707.4 Location.

- Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal, and each run of piping, that is more than 100 feet (30,480 mm) in total developed length, shall be provided with a cleanout for each 100 feet (30,480 mm), or fraction thereof, in length of such piping. An additional cleanout shall be provided in a drainage line for each aggregate horizontal change of direction exceeding 135 degrees (2.36 rad).
- EXCEPTIONS:
 - Cleanouts shall be permitted to be omitted on a horizontal drain line less than 5 feet (1,524 mm) in length unless such line is serving sinks or urinals.
 - Cleanouts shall be permitted to be omitted on a horizontal drainage pipe installed on a slope of 72 degrees (1.26 rad) or less from the vertical angle (one-fifth bend).
 - Except for the building drain, its horizontal branches, and urinals, a cleanout shall not be required on a pipe or piping that is above the floor level of the lowest floor of the building.
 - An approved type of two-way cleanout fitting, installed inside the building wall near the connection between the building drain and the building sewer or installed outside of a building at the lower end of a building drain and extended to grade, shall be permitted to be substituted for an upper terminal cleanout.

707.5 Cleaning

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

707.6 Extension

- Each cleanout extension shall be considered as drainage piping and each 90 degree (1.57 rad) cleanout extension shall be extended from a wye-type fitting or other approved fitting of equivalent sweep.

707.9 Clearance.

- Each cleanout in piping 2 inches (50 mm) or less in size shall be so installed that there is a clearance of not less than 12 inches (457 mm) in front of the cleanout. Cleanouts in piping exceeding 2 inches (50 mm) shall have a clearance of not less than 18 inches (610 mm) in front of the cleanout. Cleanouts in under-floor piping shall be extended to or above the finished floor or shall be extended outside the building where there is less than 18 inches (457 mm) vertical overall, allowing for obstructions such as ducts, beams, and piping, and 30 inches of (762 mm) horizontal clearance from the means of access to such cleanout. No under-floor cleanout shall be located exceeding 20 feet (1,524 mm) from an access door, trap door, or crawl hole.

707.11 Pressure Drainage Systems

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

707.12 Countersunk Cleanout Plugs

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

707.13 Hubless Blind Plugs

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

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

710.1 Backflow Protection

- Fixtures installed on a floor level that is lower than the next upstream manhole cover of the public, or private sewer shall be protected from backflow of sewage by installing an approved type of backwater valve.
- Fixtures on such floor level that are not below the next upstream manhole cover shall not be required to be protected by a backwater valve.
- Fixtures on floor levels above such elevation shall not discharge through the backwater valve.
- Cleanouts for drains that pass through a backwater valve shall be clearly identified with a permanent label stating "backwater valve downstream."

710.2 Sewage Discharge

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

710.3 Sewage Ejector and Pumps

- A sewage ejector or sewage pump receiving the discharge of water closets or urinals:
 - 1) Shall have a discharge capacity of not less than 20 gpm (1.26 L/s).
 - 2) In single dwelling units, the ejector or pump shall be capable of passing an 1½ inch (38 mm) diameter solid ball, and the discharge piping of each ejector or pump shall have a backwater valve and gate valve, and be not less than 2 inches (50 mm) in diameter.
 - 3) In other than single-dwelling units, the ejector or pump shall be capable of passing a 2 inch (51 mm) diameter solid ball, and the discharge piping of each ejector or pump shall have a backwater valve and gate valve, and be not less than 3 inches (80 mm) in diameter.

710.4 Discharge Line

- The discharge line from such ejector, pump, or another mechanical device shall be of approved pressure rated material and be provided with an accessible backwater or swing check valve and gate or ball valve.
- Where the gravity drainage line to which such discharge line connects is horizontal, the method of connection shall be from the top through a wye branch fitting. The gate or ball valve shall be located on the discharge side of the backwater or check valve.
- Gate or ball valves, where installed in drainage piping, shall be fullway type with working parts of corrosion-resistant metal.
- Sizes 4 inches (100 mm) or more in diameter shall have cast-iron bodies and sizes less than 4 inches (100 mm), cast-iron or copper alloy bodies.

710.5 Size of Building Drains and Sewers

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

710.7 Drainage and Venting Systems

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

710.8 Sump and Receiving Tank Construction

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

710.9 Alarm

- Such sumps and receiving tanks shall be automatically discharged and, wherein a “public use” occupancy, shall be provided with dual pumps or ejectors arranged to function alternately in normal use and independently in case of overload or mechanical failure.
- The pumps shall have an audio and visual alarm, readily accessible, that signals pump failure or an overload condition.
- The lowest inlet shall have a clearance of not less than 2 inches (51 mm) from the high-water or “starting” level of the sump.

710.10 Sump and Receiving Tank Covers and Vents

- Sumps and receiving tanks shall be provided with substantial covers having a bolt-and-gasket-type manhole or equivalent opening to permit access for inspection, repairs, and cleaning.
- The top shall be provided with a vent pipe that shall extend separately through the roof or, where permitted, be combined with other vent pipes.
- Such vent shall be large enough to maintain atmospheric pressure within the sump under normal operating conditions and, in no case, shall be less in size than that required by Table 703.2 for the number and type of fixtures discharging into the sump, nor less than 1½ inches (40 mm) in diameter.
- Where the preceding requirements are met and the vent, after leaving the sump, is combined with vents from fixtures discharging into the sump, the size of the combined vent need not exceed that required for the total number of fixtures discharging into the sump.

710.11 Air Tanks

- Air tanks shall be so proportioned as to be of equal cubical capacity to the ejectors connected in addition to that in which there shall be maintained an air pressure of not less than 2 pounds per foot (lb/ft) (3 kg/m) of height the sewage is to be raised. No water-operated ejectors shall be permitted.

711.0 Suds Relief

711.1 General

- Drainage connections shall not be made into a drainage piping system within 8 feet (2438 mm) of a vertical to horizontal change of direction of a stack containing suds-producing fixtures.
- Bathtubs, laundries, washing machine standpipes, kitchen sinks, and dishwashers shall be considered suds-producing fixtures. Where parallel vent stacks are required, they shall connect to the drainage stack at a point 8 feet (2438 mm) above the lowest point of the drainage stack.
- Exceptions:
 - 1) Single-family residences.
 - 2) Stacks receiving the discharge from less than three stories of plumbing fixtures.

712.0 Testing

712.1 Media

- The piping of the plumbing, drainage, and venting systems shall be tested with water or air except that plastic pipe shall not be tested with air.
- The Authority Having Jurisdiction shall be permitted to require the removal of cleanouts, etc., to ascertain whether the pressure has reached all parts of the system.
- After the plumbing fixtures have been set and their traps filled with water, they shall be submitted to a final test.

712.3 Air Test

- The air test shall be made by attaching an air compressor testing apparatus to a suitable opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds-force per square inch (psi) (34 kPa) or sufficient to balance a column of mercury 10 inches (34 kPa) in height.
- The pressure shall be held without the introduction of additional air for a period of not less than 15 minutes.

CHAPTER 8 INDIRECT WASTES

Chapter 8 regulates indirect waste connections that are required for plumbing fixtures and plumbing appliances dealing with food preparation, dishwashing, potable liquids, and similar equipment. an indirect connection prevents sewage from backing up into a fixture or appliance, thus providing protection against potential health hazards.

The waste pipe discharges through an air gap or air break into a waste receptor or standpipe. the protection in the form of an air gap is necessary when the contamination is a potential health hazard or cross connection with the potable water system.

Where there is no possibility of contaminating the potable water (nonpotable discharge), the indirect waste pipe may connect in the form of an air break. this method is often preferred to prevent splashing.

There are no significant changes.

801.0 General

801.1 Applicability

- This chapter shall govern the materials, design, and installation of indirect waste piping, receptors, and connections; and provisions for discharge and disposal of condensate wastes, chemical wastes, industrial wastes, and clear water wastes.

801.2 Air Gap or Air Break Required

- Indirect waste piping shall discharge into the building drainage system through an air gap or air break as set forth in this code.
- Where a drainage air gap is required by this code, the minimum vertical distance as measured from the lowest point of the indirect waste pipe or the fixture outlet to the flood-level rim of the receptor shall be not less than 1 inch (25.4 mm).

801.5 Connections from Water Distribution System

- Indirect waste connections shall be provided for drains, overflows, or relief pipes from potable water pressure tanks, water heaters, boilers, and similar equipment that is connected to the potable water distribution system. Such indirect waste connections shall be made using a water-distribution air gap constructed in accordance with Table 603.3.1.

801.6 Sterilizers

- Lines, devices, or apparatus such as stills, sterilizers, and similar equipment requiring waste connections and used for sterile materials shall be indirectly connected using an air gap.
- Each such indirect waste pipe shall be separately piped to the receptor and shall not exceed 15 feet (4572 mm). Such receptors shall be located in the same room.

803.0 Indirect Waste Piping

803.1 Materials

- Pipe, tube, and fittings conveying indirect waste shall be of such materials and design as to perform their intended function to the satisfaction of the Authority Having Jurisdiction.

803.2 Copper and Copper Alloys

- Joints and connections in copper and copper alloy pipe and tube shall be installed in accordance with Section 705.3.

804.0 Indirect Waste Receptors

804.1 Standpipe Receptors

- Plumbing fixtures or other receptors receiving the discharge of indirect waste pipes shall be approved for the use proposed and shall be of such shape and capacity as to prevent splashing or flooding and shall be located where they are readily accessible for inspection and cleaning.
- No standpipe receptor for a clothes washer shall extend more than 30 inches (762 mm), or not less than 18 inches (457 mm) above its trap weir.
- No trap for a clothes washer standpipe receptor shall be installed below the floor, but shall be roughed in not less than 6 inches (152 mm) and not more than 18 inches (457 mm) above the floor.

- No indirect waste receptor shall be installed in a toilet room, closet, cupboard, or storeroom, or in a portion of a building not in general use by the occupants thereof; except standpipes for clothes washers shall be permitted to be installed in toilet and bathroom areas where the clothes washer is installed in the same room.

805.0 Pressure Drainage Connections

805.1 General

- Indirect waste connections shall be provided for drains, overflows, or relief vents from the water supply system, and no piping or equipment carrying wastes or producing wastes or other discharges under pressure shall be directly connected to a part of the drainage system.
- The preceding shall not apply to an approved sump pump or to an approved pressure-wasting plumbing fixture or device where the Authority Having Jurisdiction has been satisfied that the drainage system is adequately sized to accommodate the anticipated discharge thereof

807.0 Appliances

807.1 Non-Classified Apparatus

- Commercial dishwashing machines, silverware washing machines, and other appliances, devices, equipment, or other apparatus not regularly classed as plumbing fixtures, which are equipped with pumps, drips, or drainage outlets, shall be permitted to be drained by indirect waste pipes discharging into an approved type of open receptor.

810.0 Steam and Hot Water Drainage Condensers and Sumps

810.1 High-Temperature Discharge

- No steam pipe shall be directly connected to plumbing or drainage system, nor shall water having a temperature above 140°F (60°C) be discharged under pressure directly into a drainage system.
- Pipes from boilers shall discharge by means of indirect waste piping as determined by the Authority Having Jurisdiction or the boiler manufacturer's recommendations.
- Such pipes shall be permitted to be indirectly connected by discharging into an open or closed condenser or an intercepting sump of an approved type that will prevent the entrance of steam or such water under pressure into the drainage system

- Closed condensers or sumps shall be provided with a vent that shall be taken off the top and extended separately, full size above the roof.
- Condensers and sumps shall be properly trapped at the outlet with a deep seal trap extending to within 6 inches (152 mm) of the bottom of the tank.
- The top of the deep seal trap shall have a 3/4 of an inch (19.1 mm) opening located at the highest point of the trap to serve as a siphon breaker.
- Outlets shall be taken off from the side in such a manner as to allow a waterline to be maintained that will permanently occupy not less than one-half the capacity of the condenser or sump.
- Inlets shall enter above the waterline. Wearing plates or baffles shall be installed in the tank to protect the shell.

- The sizes of the blowoff line inlet, the water outlets, and the vent shall be as shown in Table 810.1. The contents of condensers receiving steam or hot water under pressure shall pass through an open sump before entering the drainage system.

BOILER BLOWOFF	WATER OUTLET	VENT
3/4*	3/4*	2
1	1	2½
1¼	1¼	3
1½	1½	4
2	2	5
2½	2½	6

Table 20: Pipe connections in blowoff condensers and sumps (inches)

(Source: IAPMO/ANSI, UPC, 1 2021, table 810.1)

810.2 Sumps, Condensers, and Intercepting Tanks

- Sumps, condensers, or intercepting tanks that are constructed of concrete shall have walls and bottom, not less than 4 inches (102 mm) in thickness, and the inside shall be cement plastered not less than 1/2 of an inch (12.7 mm) in thickness.

810.3 Cleaning

- Sumps and condensers shall be provided with suitable means of access for cleaning and shall contain a volume of not less than twice the volume of water removed from the boiler or boilers connected to it where the normal water level of such boiler or boilers is reduced not less than 4 inches (102 mm).

810.4 Strainers

- An indirect waste interceptor is receiving discharge-containing particles that would clog the receptor drain shall have a readily removable beehive strainer.

811.0 Chemical Wastes

811.1 Pretreatment

- Chemical or liquid industrial wastes that are likely to damage or increase maintenance costs on the sanitary sewer system, detrimentally affect sewage treatment or contaminate surface or subsurface waters shall be pre-treated to render them innocuous before discharge into a drainage system.
- Detailed construction documents of the pre-treatment facilities shall be required by the Authority Having Jurisdiction.
- Piping conveying industrial, chemical, or process wastes from their point of origin to sewer-connected pretreatment facilities shall be of such material and design as to adequately perform its intended function to the satisfaction of the Authority Having Jurisdiction.
- Drainage discharge piping from pre-treatment facilities or interceptors shall be in accordance with standard drainage installation procedures.

811.2 Waste and Vent Pipes

- Each waste pipe receiving or intended to receive the discharge of a fixture into which acid or corrosive chemical is placed, and each vent pipe connected thereto, shall be constructed of chlorinated polyvinyl chloride (CPVC), polypropylene (PP), polyvinylidene fluoride (PVDF), chemical-resistant glass, high-silicon iron pipe, or lead pipe with a wall thickness of not less than 1/8 of an inch (3.2 mm); an approved type of ceramic glazed or unglazed vitrified clay; or other approved corrosion-resistant materials.
- CPVC pipe and fittings shall comply with ASTM F2618. PP pipe and fittings shall comply with ASTM F1412 or CSA B181.3.
- PVDF pipe and fittings shall comply with ASTM F1673 or CSA B181.3.
- Chemical-resistant glass pipe and fittings shall comply with ASTM C1053.
- High-silicon iron pipe and fittings shall comply with ASTM A861.

811.5 Permanent Record

- The owner shall make and keep a permanent record of the location of piping and venting carrying chemical waste.

811.6 Chemical Vent

- No chemical vent shall intersect vents for other services.

811.7 Discharge

- Chemical wastes shall be discharged in a manner approved by the Authority Having Jurisdiction.

811.8 Diluted Chemicals

- The provisions of this section about materials and methods of construction shall not apply to installations such as photographic or x-ray darkrooms or research or control laboratories where minor amounts of adequately diluted chemicals are discharged.

812.0 Clear Water Wastes

812.1 General

- Water lifts, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices that discharge clear wastewater into the building drainage system shall discharge through an indirect waste.

813.0 Swimming Pools

813.1 General

- Pipes carrying wastewater from swimming or wading pools, including pool drainage and backwash from filters, shall be installed as an indirect waste. Where a pump is used to discharge pool waste water to the drainage system, the pump discharge shall be installed as an indirect waste.

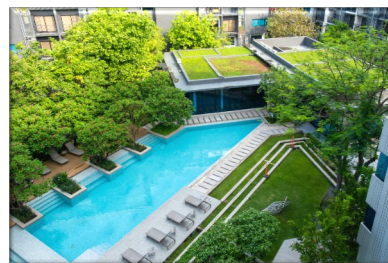


Figure 9: Swimming Pools discharge shall be through an indirect waste pipe by means of an air gap when discharging to the building drainage system

814.0 Condensate Waste and Control

814.1 Condensate Disposal

- Condensate from air washers, air-cooling coils, condensing appliances, and the over-flow from evaporative coolers and similar water-supplied equipment or similar air-conditioning equipment shall be collected and discharged to an approved plumbing fixture or disposal area.
- Where discharged into the drainage system equipment shall drain using an indirect waste pipe.
- The waste pipe shall have a slope of not less than 1/8 inch per foot (10.4 mm/m) or 1 percent slope and shall be of an approved corrosion-resistant material not smaller than the outlet size in accordance with Section 814.3 or Section 814.4 for air-cooling coils or condensing appliances, respectively. Condensate or wastewater shall not drain over a public way.

814.1.1 Condensate Pumps

- Where approved by the Authority Having Jurisdiction, condensate pumps shall be installed in accordance with the manufacturer's installation instructions.
- Pump discharge shall rise vertically to a point where it is possible to connect to a gravity condensate drain and discharged to an approved disposal point.
- Each condensing unit shall be provided with a separate sump and interlocked with the equipment to prevent the equipment from operating during a failure.
- Separate pumps shall be permitted to connect to a single gravity indirect waste where equipped with check valves and approved by the Authority Having Jurisdiction.

814.2 Condensate Control

- Where any equipment or appliance is installed in a space where damage is capable of resulting from condensate overflow, a drain line shall be provided and shall be drained in accordance with Section 814.1. An additional protection method for condensate overflow shall be provided in accordance with one of the following:
 - 1) A water level detecting device that will shut off the equipment or appliance in the event the primary drain is blocked.
 - 2) An additional watertight pan of corrosion-resistant material, with a separate drain line, installed beneath the cooling coil, unit, or the appliance to catch the overflow condensate due to a clogged primary condensate drain.
 - 3) An additional drain line at a level that is higher than the primary drain line connection of the drain pan.
 - 4) An additional watertight pan of corrosion-resistant material with a water level detection device installed beneath the cooling coil, unit, or the appliance to catch the over-flow condensate due to a clogged primary condensate drain and to shut off the equipment.

814.3 Condensate Waste Pipe Material and Sizing

- Condensate waste pipes from air-cooling coils shall be sized in accordance with the equipment capacity as specified in Table 814.3. The material of the piping shall comply with the pressure and temperature rating of the appliance or equipment and shall be approved for use with the liquid being discharged.
- The size of condensate waste pipes is for one unit or a combination of units, or as recommended by the manufacturer. The capacity of waste pipes assumes a $\frac{1}{8}$ inch per foot (10.4 mm/m) or 1 percent slope, with the pipe running three-quarters full at the following pipe conditions:
- Condensate drain sizing for other slopes or other conditions shall be approved by the Authority Having Jurisdiction.

814.3.1 Cleanouts

- Condensate drain lines shall be configured or provided with a cleanout to permit the clearing of blockages and for maintenance without requiring the drain line to be cut.

814.4 Appliance Condensate Drains

- Condensate drain lines from individual condensing appliances shall be sized as required by the manufacturer's instructions. Condensate drain lines serving more than one appliance shall be approved by the Authority Having Jurisdiction prior to installation.

814.5 Point of Discharge

- Air-conditioning condensate waste pipes shall connect indirectly, except where permitted in Section 814.6, to the drainage system through an air gap or air break to trapped and vented receptors, dry wells, leach pits, or the tailpiece of plumbing fixtures. A condensate drain shall be trapped in accordance with the appliance manufacturer's instructions or as approved.

814.6 Condensate Waste from Air-Conditioning Coils

- Where the condensate waste from air-conditioning coils discharges by direct connection to a lavatory tailpiece or to an approved accessible inlet on a bathtub overflow, the connection shall be located in the area controlled by the same person controlling the air-conditioned space.

814.7 Plastic Fittings

- Female plastic screwed fittings shall be used with male plastic fittings and plastic threads.

CHAPTER 9 VENTS

Chapter 9 regulates the material, design, and installation of vents. A vent system is a pipe or pipes installed in a drainage system that provide a flow of air to and from the system to ventilate it, provide a circulation of air to eliminate trap siphonage, and reduce back-pressure and vacuum surge.

In addition, vents provide the rapid and silent flow of waste without exposing occupants of the building to any sewer gases.

Proper installation of vents is crucial, as a telltale sign that there is a problem in the drain and vent system is related to the elevation of the horizontal portion of the venting. Venting is not limited to sanitary drainage systems.

CHAPTER 9 VENTS (CONT'D)

(2018)

903.1 Applicable Standards:

- Vent pipe and fittings shall comply with the applicable standards referenced in Table 701.2, except that:
 - [...] These tests shall comply with all requirements of the standards to include the sample size, both for width and length. Plastic pipe shall not be tested filled with water.

(2021)

903.1 Applicable Standards:

- Vent pipe and fittings shall comply with the applicable standards referenced in Table 701.2, except that:
 - [...] Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.

(2018)

911.1 Circuit Vent Permitted:

- A maximum of eight floor fixtures connected to a horizontal branch shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream trap arm connection to the most upstream trap arm connection to the horizontal branch.

(2021)

911.1 Circuit Vent Permitted:

- A maximum of eight floor ~~fixtures~~ **outlet water closets, showers, bathtubs, or floor drains** connected to a horizontal branch shall be permitted to be circuit vented. Each ~~fixture drain~~ **trap arm** shall connect horizontally to the horizontal branch being circuit vented in accordance with Table 1002.2. The horizontal branch shall be classified as a **drain** and a vent from the most downstream trap arm connection to the most upstream trap arm connection to the horizontal branch.

911.2.1 Multiple Circuit Vents (Newly Added)

- When multiple circuit vents are interconnected according to Section 911.4.1, each individual circuit vent shall be sized according to Section 911.2. The vent pipe connecting each circuit vent shall be sized according to Table 703.2.

911.4 Slope and Size of Horizontal Branch (Newly Added)

- The vented section of the horizontal branch shall be uniformly sloped and not more than 1 inch per foot (83.3 mm/m). The entire length of the vented section of the horizontal branch shall be sized for the total drainage discharge to the branch according to Table 703.2.

911.4.1 Multiple Circuit-Vented Branches (Newly Added)

- Circuit vented horizontal branches are permitted to be connected together. Each group of a maximum of eight fixtures shall be considered a separate circuit vent and shall be in accordance with Section 911.4.1.1 and Section 911.4.1.2.

911.4.1.1 Size of Parallel Horizontal Branches (Newly Added)

- Parallel horizontal circuit vented branches shall be permitted to connect on the same floor level. Each separate circuit-vented horizontal branch that is interconnected shall be sized independently in accordance with Section 911.4.

911.4.1.2 Size of Continuous Horizontal Branches (Newly Added)

- Two or more circuit vented systems continuous on the same horizontal branch shall be uniformly sized for the total discharge into the branch.

901.0 General

901.1 Applicability

- This chapter shall govern the materials, design, and installation of plumbing vent systems.

901.2 Vents Required

- Each plumbing fixture trap, except as otherwise provided in this code, shall be protected against siphonage and backpressure, and air circulation shall be ensured throughout all parts of the drainage system by means of vent pipes installed in accordance with the requirements of this chapter and as otherwise required by this code.

902.0 Vents Not Required

902.1 Interceptor

- Vent piping shall be permitted to be omitted on an interceptor where such interceptor acts as a primary settling tank and discharges through a horizontal indirect waste pipe into a secondary interceptor. The second interceptor shall be properly trapped and vented.

902.2 Bars, Soda Fountains, and Counter

- Traps serving sinks that are part of the equipment of bars, soda fountains, and counters need not be vented where the location and construction of such bars, soda fountains, and counters are such as to make it impossible to do so.
- Where such conditions exist, said sinks shall discharge using approved indirect waste pipes into a floor sink or other approved type of receptor.

903.0 Materials

903.1 Applicable Standards

- Vent pipe and fittings shall comply with the applicable standards referenced in Table 701.2, except that:
 1. No galvanized steel or 304 stainless steel pipe shall be installed underground and shall be not less than 6 inches (152 mm) aboveground.
 2. ABS and PVC DWV piping installations shall be in accordance with Chapter 14 "Firestop Protection." Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flamespread index of not more than 25 and a smoke-developed index of not more than 50 where tested in accordance with ASTM E84 or UL 723. Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.

903.2 Use of Copper or Copper Alloy Tubing

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

903.2.1 Aboveground

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



Figure 21: Copper shall not be used for chemical or industrial wastes as defined in Section 811.0

903.2.2 Prohibited Use

- Copper or copper alloy tube shall not be used for chemical or industrial wastes as defined in Section 811.0.

903.2.3 Marking

- Copper or copper alloy tubing, in addition to the required incised marking, shall be marked in accordance with either ASTM B306 or ASTM B88.
- The colors shall be Type K, green; Type L, blue; Type M, red; and Type DWV, yellow.

903.3 Changes in Direction

- Changes in the direction of vent piping shall be made by the appropriate use of approved fittings, and no such pipe shall be strained or bent. Burred ends shall be reamed to the full bore of the pipe.

904.0 Size of Vents

904.1 Size

- The size of vent piping shall be determined from its length and the total number of fixture units connected thereto, in accordance with Table 703.2.
- The diameter of an individual vent shall be not less than 1¼ inches (32 mm) nor less than one-half the diameter of the drain to which it is connected.
- In addition, the drainage piping of each building and each connection to a public sewer or a private sewage disposal system shall be vented by means of one or more vent pipes, the aggregate cross-sectional area of which shall be not less than that of the largest required building sewer as determined from Table 703.2.
- Vent pipes from fixtures located upstream from pumps, ejectors, backwater valves, or other devices that obstruct the free flow of air and other gases between the building sewer and the outside atmosphere shall not be used for meeting the cross-sectional area venting requirements of this section.

- Exception: Where connected to a common building sewer, the drainage piping of two or more buildings located on the same lot and under one ownership shall be permitted to be vented by means of piping sized in accordance with Table 703.2, provided the aggregate cross-sectional area of vents is not less than that of the largest required common building sewer.

904.2 Length

- Not more than one-third of the total permitted length, in accordance with Table 703.2, of a minimum-sized vent shall be installed in a horizontal position.
- Where a minimum-sized vent is increased one pipe size for its entire length, the maximum length limitation shall not apply.

905.2 Horizontal Drainage Pipe

- Where vents connect to a horizontal drainage pipe, each vent pipe shall have its invert taken off above the drainage centerline of such pipe downstream of the trap being served.

905.6 Common Vertical Pipe

- Two fixtures shall be permitted to be served by a common vertical pipe where each such fixture wastes separately into an approved double fitting having inlet openings at the same level.

906.0 Vent Termination

906.1 Roof Termination

- Each vent pipe or stack shall extend through its flashing and shall terminate vertically not less than 6 inches (152 mm) above the roof nor less than 1 foot (305 mm) from a vertical surface. ABS and PVC piping exposed to sunlight shall be protected by water based synthetic latex paints.

906.4 Outdoor Installations

- Vent pipes for outdoor installations shall extend not less than 10 feet (3048 mm) above the surrounding ground and shall be securely supported.

906.6 Lead

- Sheet lead shall comply with the following:
 1. For safe pans – not less than 4 pounds per square foot (lb/ft²) (19 kg/m²) or 1/16 of an inch (1.6 mm) thick.
 2. For flashings or vent terminals – not less than 3 lb/ft² (15 kg/m²) or 0.0472 of an inch (1.2 mm) thick.
 3. Lead bends and lead traps shall be not less than 1/8 of an inch (3.2 mm) in wall thickness.

907.0 Vent Stacks and Relief Vents

907.1 Drainage Stack

- Each drainage stack that extends 10 or more stories shall be served by a parallel vent stack, which shall extend undiminished in size from its upper terminal and connect to the drainage stack at or immediately below the lowest fixture drain.
- Each such vent stack shall also be connected to the drainage stack at each fifth floor, counting down from the uppermost fixture drain, using a yoke vent, the size of which shall be not less in diameter than either the drainage or the vent stack, whichever is smaller.

908.0 Wet Venting

908.1 Vertical Wet Venting

- Wet venting is limited to vertical drainage piping receiving the discharge from the trap arm of one and two fixture unit fixtures that also serves as a vent not exceeding four fixtures.
- Wet-vented fixtures shall be within the same story; provided, further, that fixtures with a continuous vent discharging into a wet vent shall be within the same story as the wet-vented fixtures.
- No wet vent shall exceed 6 feet (1829 mm) in developed length.

908.1.1 Size

- The vertical piping between two consecutive inlet levels shall be considered a wet-vented section.
- Each wet-vented section shall be not less than one pipe size exceeding the required minimum waste pipe size of the upper fixture or shall be one pipe size exceeding the required minimum pipe size for the sum of the fixture units served by such wet-vented section, whichever is larger, but in no case less than 2 inches (50 mm) in diameter.

908.1.2 Vent Connection

- Common vent sizing shall be the sum of the fixture units served but, in no case, smaller than the minimum vent pipe size required for a fixture served, or by Section 904.0.

909.0 Special Venting for Island Fixtures

909.1 General

- Traps for island sinks and similar equipment shall be roughed in above the floor and shall be permitted to be vented by extending the vent as high as possible, but not less than the drainboard height and then returning it down-ward and connecting it to the horizontal sink drain immediately downstream from the vertical fixture drain.
- The return vent shall be connected to the horizontal drain through a wye-branch fitting and shall, in addition, be provided with a foot vent taken off the vertical fixture vent by means of a wye branch immediately below the floor and extending to the nearest partition and then through the roof to the open air, or shall be permitted to be connected to other vents at a point not less than 6 inches (152 mm) above the flood-level rim of the fixtures served.

- Drainage fittings shall be used on the vent below the floor level, and a slope of not less than $\frac{1}{4}$ inch per foot (20.8 mm/m) back to the drain shall be maintained.
- The return bend used under the drainboard shall be a one-piece fitting or an assembly of a 45 degree (0.79 rad), a 90 degree (1.57 rad), and a 45 degree (0.79 rad) elbow in the order named.
- Pipe sizing shall be as elsewhere required in this code. The island sink drain, upstream of the returned vent, shall serve no other fixtures. An accessible cleanout shall be installed in the vertical portion of the foot vent.

910.0 Combination Waste and Vent Systems

910.1 Where Permitted

- Combination waste and vent systems shall be permitted where structural conditions preclude the installation of conventional systems as otherwise prescribed by this code.

910.4 Size

- Each waste pipe and each trap in such a system shall be not less than two pipe sizes exceeding the sizes required by Chapter 7 of this code, and not less than two pipe sizes exceeding a fixture tailpiece or connection.

910.5 Vertical Waste Pipe

- No vertical waste pipe shall be used in such a system, except the tailpiece or connection between the outlet of a plumbing fixture and the trap. Such tailpieces or connections shall be as short as possible, and in no case shall exceed 2 feet (610 mm).
- Exception: Branch lines shall be permitted to have 45 degree (0.79 rad) vertical offsets.

910.6 Cleanouts

- An accessible cleanout shall be installed in each vent for the combination waste and vent system.
- Cleanouts shall not be required on a wet-vented branch serving a single trap where the fixture tailpiece or connection is not less than 2 inches (50 mm) in diameter and provides ready access for cleaning through the trap.

911.0 Circuit Venting

911.1 Circuit Vent Permitted

- A maximum of eight fixtures connected to a horizontal branch drain shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream fixture drain connection to the most upstream fixture drain connection to the horizontal branch. Given its greaseproducing potential, restaurant kitchen equipment shall not be connected to a circuit vented system. Each trap arm shall connect horizontal to the horizontal branch being circuit vented in accordance with Table 1002.2.
- EXCEPTION: Back-outlet and wall-hung water closets shall be permitted to be circuit vented provided that no floor-outlet fixtures are connected to the same horizontal branch.

911.4 Slope and Size of Horizontal Branch

- The vented section of the horizontal branch shall be uniformly sloped and not more than 1 inch per foot (83.3 mm/m). The entire length of the vented section of the horizontal branch shall be sized for the total drainage discharge to the branch according to Table 703.2.

911.4.1 Multiple Circuit-Vented Branches

- Circuit-vented horizontal branches are permitted to be connected together. Each group of a maximum of eight fixtures shall be considered a separate circuit vent and shall be in accordance with Section 911.4.1.1 and Section 911.4.1.2.

912.0 Engineered Vent System

912.1 General

- The design and sizing of a vent system shall be permitted to be determined by accepted engineering practices. The system shall be designed by a registered design professional and approved in accordance with Section 301.5.

912.2 Minimum Requirements

- An engineered vent system shall provide protection of the trap seal in accordance with Section 901.3.

THANK YOU FOR LISTENING!

This concludes our presentation, and we hope that you enjoyed it.

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REFERENCES

This interactive presentation was adapted from *IAPMO/ANSI, UPC, 1 2021 including Washington amendments.*

COURSE PROVIDER BIOGRAPHY

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